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GÖSSWALD (K.). **Die Wirkung des Kontaktgiftes Pyrethrum auf Forstschädlinge unter dem Einfluss der physiologischen Disposition der Schädlinge und der Einwirkung von ökologischen Aussenfaktoren.** [The Action of the Contact Poison Pyrethrum on Forest Pests under the Influence of the Physiological Condition of the Pests and of the Effect of Ecological External Factors.] *Z. angew. Ent.* **20** no. 4 pp. 489–530, 10 figs., 44 refs. Berlin, March 1934.

A series of laboratory experiments on the action of pyrethrum dust were made in Bavaria with Dusturan, which is said to contain 0·2 per cent. pyrethrin, with magnesium silicate as the chief carrier. The insects used were larvae of *Lymantria monacha*, L., *Porthetria dispar*, L., *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.), *Dendrolimus pini*, L., *Bupalus piniarius*, L., *Lygaeonematus* (*Nematus*) *laricis*, Htg., and *Diprion* (*Lophyrus*) *pini*, L. The results are recorded in detail for each species. The larvae of *Bupalus* were less resistant to the action of the poison than those of the other four moths, which are hairy, but more resistant than the sawfly larvae. The sawflies and *Bupalus* were more resistant than the early instars of the other Lepidoptera, but the latter subsequently became so resistant that the value of dusting would be greatly reduced if it was done after the third instar. If the older instars have to be treated, 1½ times the normal amount of 45 lb. per acre would be required to kill nearly 100 per cent. of the fourth instar of *L. monacha* and double this amount to kill 80 per cent. of the fifth. For the last instar of *B. piniarius*, 1½ times the normal dose is required.

In a given species, the toxic action showed very great variation according to physiological condition, which was much influenced by external factors such as temperature and humidity. Each species and instar had a specific temperature optimum of resistance, corresponding largely to the vital optimum, which was between 16 and 24°C. [60·8 and 75·2°F.] for all the species examined. Resistance was highest at relative humidities approximating to 100 per cent., without regard to the vital optimum.

The toxic effect of dusting is enhanced by previous dry weather, with temperatures above or below the optimum range indicated. Temperature and humidity acted in this manner also after dusting, except that rain, simulated in the laboratory, increased the effect of a recently applied dust owing to its mechanical action. The determination of the optimum weather for treatment is important with a contact dust, as the larvae are more susceptible at temperatures and humidities at which feeding is reduced. Stomach poisons, on the contrary, have to act at periods when the larvae are in optimum conditions of resistance. The speedy action of a contact poison is most useful in preventing complete defoliation, and the rapid volatility of the pyrethrin greatly reduces the time that it is dangerous to bees, etc., as compared with arsenicals.

In *B. piniarius*, which has a long pupal period, an after-effect of the poison was noted in pupae and adults, sometimes increasing the mortality by 60 per cent. The adults that emerged were all females.

Differences in susceptibility depend not only on morphological differences but also on chemico-physical characters. The higher the pH value of the larva, the more resistant it proved. This value

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increased with high humidity and age. Larvae in rain were more alkaline and resistant than dry ones. Hairy larvae were more alkaline than smooth ones, and the latter are on an average found in a drier biotope than the former. The cuticle and hair covering may perhaps maintain a given chemico-physiological balance.

LÜHMANN (M.). **Beitrag zur Biologie des Schneeballkäfers** *Galerucella viburni* **Payk., mit besonderer Berücksichtigung der Brutfürsorge und der mit diesen Instinktäusserungen in Zusammenhang stehenden anatomischen und physiologischen Besonderheiten.** [A Contribution to the Biology of the Guelder-rose Leaf Beetle, with particular Regard to Brood Protection and to the anatomical and physiological Peculiarities connected with this Instinct.]—*Z. angew. Ent.* **20** no. 4 pp. 531–564, 15 figs., 18 refs. Berlin, March 1934.

A detailed account is given of the results of a study in Germany of various aspects of the bionomics and morphology of *Galerucella viburni*, Payk. [*cf. R.A.E*, A **20** 151], particularly with reference to the manner in which the eggs are laid. Both adults and larvae feed on the leaves of *Viburnum* spp.; the beetle is not a serious pest, but measures against it are sometimes desirable. The adults occur from the end of July to the end of October, and the eggs are laid in chambers hollowed in the branches and closed with a cover of particles of bark that has been ingested by the female beetle and stored in a special portion of the rectum. The larvae hatch in May, and the prepupal and pupal stages (in the soil) last about a month. The eggs were parasitised by *Tetrastichus ooctonus*, Kawall, which overwintered as a larva and like its host had one generation a year, and large numbers of them were sometimes destroyed by the mite, *Monieziella entomophaga*, Laboulbène.

SPEYER (W.). **Obstbaumkarbolineum als Schädlingsbekämpfungsmittel.** [Tar Distillates as Insecticides.]—*Z. angew. Ent.* **20** no. 4 pp. 565–589, 2 pp. refs. Berlin, March 1934.

This paper summarises data obtained on the Lower Elbe regarding the insecticidal action, wetting power and capacity for remaining in emulsion of various proprietary tar distillates. Experiments showed that tests on fish afford no guide to insecticidal power.

Eggs of *Psylla mali*, Schm., were uniformly sensitive almost throughout the winter and even to concentrations as low as 2 per cent., but those of *Cheimatobia brumata*, L., were most sensitive during the fortnight prior to hatching. Only one brand of tar distillate was effective against *Anthonomus pomorum*, L., and larvae of *Cydia pomonella*, L., even when removed from their cocoons, were very resistant to high concentrations. The sprays were effective against the eggs of *Argyresthia ephippiella*, F., *Lygus pabulinus*, L., and *Plesiocoris rugicollis*, Fall., and also against those of the mite, *Paratetranychus pilosus*, C. & F. [*cf. R.A.E.*, A **17** 501].

It was found that insecticidal efficiency was not related either to wetting power or to the stability of the emulsion formed.

[Kozhanchikov (I. V.).] Kozhantschikow (I. W.). **Zur Frage nach dem Temperaturoptimum des Lebens.** [The Question of the Vital Optimum Temperature.] **Die individuelle Wärmeregulation der Insekten.** [Individual Heat-regulation in Insects.] —*Zool. Anz.* **103** no. 1–2 pp. 30–35, 1 fig., 5 refs. Leipzig, 1st June 1933. **ii. Ueber die Temperaturabhängigkeit einzelner physiologischer Prozesse und ihre Beziehung auf das Lebensoptimum des Organismus.** [ii. On the Dependence on Temperature of individual Physiological Processes and their Relation to the Vital Optimum of the Organism.]—*Z. angew. Ent.* **20** no. 4 pp. 590–610, 4 figs., 3 pp. refs. Berlin, March 1934.

In the second of these papers, the dependence of respiration, etc., on temperature was investigated in *Blatta orientalis*, L., some experiments being also made with Acridids and Lepidoptera.

[Meĭer] Meyer (N. F.). **Schlupfwespen, die in Russland in den letzten Jahren aus Schädlingen gezogen sind.** [Hymenopterous Parasites reared in recent Years from Pests in Russia.]—*Z. angew. Ent.* **20** no. 4 pp. 611–618. Berlin, March 1934.

This list records the parasites received from 1928 to 1932 under their hosts. Previous lists have been noticed [*R.A.E.*, A **18** 131 ; etc.].

Gause (G. F.). **Ueber einige quantitative Beziehungen in der Insekten-Epidemiologie.** [On some Quantitative Relations in Insect Epidemiology.]—*Z. angew. Ent.* **20** no. 4 pp. 619–623, 2 figs., 12 refs. Berlin, March 1934.

In connection with studies of animal populations, Lotka and Volterra have analysed mathematically the destruction of one species by another. The present author compares unpublished laboratory data obtained by Smirnov and Vladimirov on the Pteromalid, *Mormoniella vitripennis*, Wlk., parasitising blow-fly pupae, with the results shown by theoretical calculation. He concludes that there is a highly characteristic relation between the increase of the parasite and the density of its host, though this is rather more complicated than such calculation would indicate.

Meyer (E.). **Ein einfacher, selbstherstellbarer Thermohygrostat mit innerer Luftzirkulation.** [A simple, home-made Thermohygrostat with internal Air Circulation.]—*Z. angew. Ent.* **20** no. 4 pp. 624–635, 8 figs., 10 refs. Berlin, March 1934.

A brief survey is given of various patterns of apparatus for regulating temperature and moisture for laboratory investigations. The thermohygrostat described maintains a constant degree of humidity in breeding jars containing living plant parts with simultaneous regulation of the temperature and follows so far as possible the construction adopted by Friederichs and Steiner [*R.A.E.*, A **19** 126].

Schedl (K.). **Kleiner Beitrag zur Kenntnis der Holzschädlinge.** [A short Contribution to the Knowledge of Wood Pests.]—*Z. angew. Ent.* **20** no. 4 pp. 638–639, 1 fig. Berlin, March 1934.

Examination of samples of wood infested by pests in Germany showed that oak from buildings and wood-yards was usually attacked

by *Lyctus linearis*, Goeze, which is apparently of more importance than is generally realised. In coniferous timber from buildings, the species found were nearly always *Hylotrupes bajulus*, L., and *Anobium punctatum*, DeG. (*striatum*, Ol.). Spruce beams and floor-boards in a room were completely destroyed by the weevil, *Eremotes* (*Rhyncolus*) *porcatus*, Germ. The floor beams in a cargo lighter were severely infested by the Oedemerid, *Nacerda melanura*, L., above the level of the water covering the bottom. Removal of some of the beams and painting the others with Xylamon stopped the attack.

Ulrich (A.). **Die Makrofauna der Waldstreu.** [The Macrofauna of Forest Litter.]—*Z. angew. Ent.* **20** no. 4 pp. 640–642. Berlin, March 1934.

The importance of the macrofauna of forest litter in promoting the decomposition of the latter is discussed. In deciduous litter in Germany Apterygota and mites represented respectively 41 and 55 per cent. of the total fauna, the corresponding figures for spruce litter being 26 and 73 per cent.

Douglass (J. R.). **Habits, Life-history, and Control of the Mexican Bean Beetle in New Mexico.**—*Tech. Bull. U.S. Dep. Agric.* no. 376, 45 pp., 30 figs., 7 refs. Washington, D.C., August 1933. [Recd. April 1934.]

An account is given of observations made in the Estancia Valley during 1923–31 on the bionomics of *Epilachna corrupta*, Muls., on beans [*R.A.E.*, A **18** 582 ; **21** 538 ; etc.]. The leaves are skeletonised by the adults and larvae, which feed on the lower surface, but other aerial parts may also be attacked. Severely infested plants appear dried up, and the pods are deformed and become soaked during rain, especially when piled up before threshing. Experiments showed that defoliation caused the greatest reduction in yield when it was effected as soon as the plants began to bloom. The period before females that had emerged from hibernation began to oviposit was longer early in the season ; for 18 females that emerged on 1st July, it varied from 7 to 13 days. The oviposition period ranged from 18 to 76 days, with an average of 51, and the interval between depositions from 1 to 12, with an average of 3·2. Few egg-masses were deposited after 28th August. The number deposited by one female was 5–26, with an average of 16·9, and the average number of eggs in each was 53. The incubation period was 7–20 days at a mean temperature of 56–76°F. Most of the eggs hatched in 8–10 days. The larval period was 21–27 days, and the pupal 8–10 during summer.

The Tachinid, *Nemorilla maculosa*, Mg., was reared from parasitised larvae, and the Melyrid, *Collops bipunctatus*, Say, was seen feeding on the eggs in the field. Turkeys feed on the adults. Drought accompanied by dry winds in June makes the bean leaves turn up towards the sun, thus causing the eggs to dry up and collapse or fall to the ground. During such periods, *Frankliniella tritici*, Fitch, is numerous and eats the leaf tissue round the base of the egg-masses, no doubt contributing to their falling. Heavy rainfall washes the adult beetles from the leaves to the ground, where they may be preyed on by Carabids or killed by exposure, but the author has observed such dislodged females ovipositing in the mud.

Experiments with a number of insecticides carried out in 1929 and 1930 are described, and the results and cost of treatments and the

meteorological conditions at the time are shown in tables. They are typical of eight years' experimental work, on the basis of which recommendations for control are given [**20** 407]. Suggestions are also made for planting beans early or late (in irrigated areas), in order that they may escape injury (since the beetles remain in hibernation until the advent of the summer rains), and for co-operative collection of the beetles in autumn under the particular conditions of the Estancia Valley.

YOTHERS (M. A.). **Biology and Control of Tree Hoppers injurious to Fruit Trees in the Pacific Northwest.**—*Tech. Bull. U.S. Dep. Agric.* no. 402, 45 pp., 8 pls., 18 figs., 35 refs. Washington, D.C., February 1934.

A more detailed account is given of studies carried out from 1923 to 1928 of various Membracids the oviposition punctures of which cause considerable injury to young orchard and nursery trees in Washington, Oregon and Idaho [*R.A.E.*, A **18** 370]. *Ceresa bubalus*, F. (buffalo treehopper), to which all the damage caused had previously been generally attributed, is actually less important than *Stictocephala inermis*, F., and *C. basalis*, Wlk., all stages of which are described, with notes on their distribution and biology. Minor observations deal with *C. bubalus* and *C. albidosparsa*, Stål. The feeding of the nymphs on lucerne and sweet clover (*Melilotus*) does not cause noticeable injury. Trees in which the eggs are laid include apple, cherry, peach, pear and prune.

Another Membracid, *Heliria rubidella*, Ball, has been found in considerable numbers on apple at Wenatchee, Washington, since 1926 [**17** 384]. The eggs are laid in the twigs, one in each of two more or less closely placed parallel slits. The nymphs hatch in late April or early May. They remain on the twigs, feeding on the plant juices, and mature in June. The adults occasionally fly to neighbouring trees. The presence of large numbers on sickly branches of certain varieties of apple was found to be due to the odour given off by the limbs, the final destruction of which was doubtless hastened by their feeding.

Of various sprays tested against these Membracids, the most effective was lubricating oil emulsion or miscible oil applied in March, which at a concentration of 4 per cent. oil killed 90–100 per cent. of the eggs. As such sprays are regularly applied against *Aspidiotus perniciosus*, Comst., and mites (*Paratetranychus pilosus*, C. & F., and *Bryobia praetiosa*, Koch), no extra application is required. Lime-sulphur (4°Bé.) appeared to be of little value. No noticeable control resulted from sprays of nicotine sulphate and lubricating oil emulsion, applied separately or in combination, against the nymphs on the cover crops. Where injury is serious and the use of oil sprays is inadvisable, clean cultivation to remove all auxiliary food-plants might be justified.

PAYNE (N. M.). **The Differential Effect of Environmental Factors upon *Microbracon hebetor* Say (Hymenoptera: Braconidae) and its Host, *Ephestia kühniella* Zeller (Lepidoptera: Pyralidae). II.**—*Ecol. Monogr.* **4** no. 1 reprint 46 pp., 4 figs., 5 pp. refs. Durham, N.C., January 1934.

The literature dealing with host-parasite balance and in particular with *Ephestia kühniella*, Zell., and *Microbracon hebetor*, Say, is reviewed

in detail, and the methods and material used in the experiments are described.

The following is taken from the author's summary and conclusions : One genetic strain of *M. hebetor*, studied in detail, showed a high reproductive potential [*R.A.E.*, A **21** 667] except at extreme temperatures ; all the eggs hatched, and almost all the females oviposited. The life-cycle from egg to adult was 7–8 days at 36°C. [96·8°F.] and 30–40 at 15°C. [59°F.]. When 10 are placed with 100 larvae of *E. kühniella*, the parasites are able to exterminate the host at all temperatures above 15°C. *E. kühniella* can live between —15 and 50°C. [5–122°F.]. Race and previous history of the individual affect the extremes of temperature that it can endure. The total temperature scale of the strain of the parasite used in these experiments was from —12 to 65°C. [10·4–149°F.] (external temperature). At a given environmental temperature, the internal temperature of light-coloured forms is less than that of dark-coloured ones. Yellow adults are produced at high temperatures and black ones at low. Both host and parasite are extremely resistant to cold.

A formula is given for finding the number of generations required for the parasite to overtake the host if both reproduce synchronously. Since, however, they do not do so, the balance is determined not only by the relative reproductive potentials but also by the number of generations of the parasite that develop on that stage of the host on which it feeds and by the period for which it can survive in the absence of hosts in that stage. The rapidly developing strain of *E. kühniella* [*cf. loc. cit.*] is thus generally less susceptible to attack than the slowly developing one, since there is time for more parasites to develop on the latter. On the other hand, if the adult parasite emerges when the host is in the egg or pupal stage and has to wait for the appearance of larvae, the fast strain may be exterminated while the slow one survives. At 15°C., a retardation of a day in the development of the host may mean that the parasite can destroy it, but the death of even a few parasite larvae may reverse the balance in favour of the host. The efficiency of a parasite cannot be determined until the second or third generation has developed. The ability of the larva to escape attack is due in part to the fact that it is negatively phototropic and the parasite adult is positively phototropic.

The lack of synchronisation in the life-cycles of *E. kühniella* and *M. hebetor* suggests that their association is of recent origin. Since the host is extremely sensitive to low humidity and is unable to develop all its stages above 34·4°C. [93·92°F.], it could not have originated in a hot, dry climate. The parasite, however, is adapted to a hot, dry, almost desert climate, the only stage not resistant to desiccation being the feeding larva.

MARCHIONATTO (J. B.) & BLANCHARD (E. E.). **Parásitos mas importantes de la langosta** (*Schistocerca paranensis* **Burm.) en la Republica Argentina.**—*Bol. Minist. Agric. Argent.* **34** no. 2–3 pp. 225–266, 9 pls., 3 figs., 2 pp. refs. Buenos Aires, 1933. [Recd. April 1934.]

The first chapter of this paper on the parasites of *Schistocerca paranensis*, Burm., in Argentina, by Marchionatto, deals with bacteria and fungi, and the second, by Blanchard, with Arthropods, Mermithids and Gregarines. The literature regarding the more important of

them, in Argentina and other parts of the world, is reviewed, including attempts to use them for the biological control of locusts.

In experiments in Argentina, *Coccobacillus acridiorum* proved of no value in control. A species of *Sporotrichum*, here described as *S. paranense*, sp. n., which appears to be specific to *Schistocerca paranensis*, is being tested in the laboratory. Egg-pods of this locust from various parts of Argentina were parasitised by a species of *Fusarium* rather similar to *F. acridiorum* discovered in Algeria on adults of *Schistocerca gregaria*, Forsk. (*peregrina*, Ol.).

The most important egg-parasite in Argentina is *Phorbia cilicrura*, Rond., the synonymy and distribution of which are reviewed, with a description of all stages. The eggs were laid near those of *Schistocerca*, which were attacked by the larvae. The adults occur throughout the year, and there appear to be at least three generations. Though they develop readily in the egg-pods of the locust, the larvae feed normally on vegetable substances. This Anthomyiid is common in all the humid districts of Argentina, but attempts to breed it in the laboratory were unsuccessful.

A key is given to the four species of *Sarcophaga* that parasitise the hoppers and adults of *Schistocerca* in Argentina, *viz.*: *S. caridei*, Brèthes, *S. lambens*, Wied. (*sternodontis*, Tns.), *S. barbata*, Thoms., and *S. varia*, Wlk. The regional distribution of *S. caridei*, which is specific to *S. paranensis*, is recorded. The adults paired 18 hours after emergence. Gravid females contained 100–200 eggs in each ovary. The larvae hatch in the oviduct and are deposited on the locusts. In the laboratory, the larval stage lasted about 6 days. Pupation occurred on the surface of the ground. Breeding is difficult, as no suitable food for the adults has been found and the larvae accepted locusts only. *Brachycoma acridiorum*, Weyenb., a Calliphorid confined to Argentina [*cf. R.A.E.*, A **16** 82], appears only in the years of locust invasions and is therefore probably a specific parasite. *Muscina stabulans*, Fall., may be an occasional parasite.

Trox suberosus, F., which has been stated to eat the eggs, appeared only to seek the holes made by the locust. A mite, here described as *Tyroglyphus denieri*, sp. n., destroyed the eggs in Santa Fé, and *Calosoma* sp. and *Atheta* sp. were also observed to feed on the eggs. Other parasites of the hoppers and adults were a mite, *Eutrombidium* sp., which was too rare to be of value, *Hexamermis acridiorum*, Weyenb., which is common in Argentina but does not lend itself to use in biological control, and *Gregarina paranensis*.

Subramaniam (T. V.). **Vegetable Fish Poisons as Insecticides.**—*Mysore agric. Calendar* 1934 pp. 41, 45. Bangalore, 1934.

A list of plants used as fish poisons in Mysore is given, and tests of sprays and dusts made from *Mundulea suberosa* as insecticides are briefly described [*R.A.E.*, A **21** 500, etc.]. A powder made from the dried bark scattered thinly over grain in bins gave complete protection against pests, particularly Bruchids.

Destructive Insect and Pest, England. The Importation of Raw Cherries Order 1934.—*Statutory Rules & Orders*, 1934 no. 446, 4 pp. London, 7th May 1934.

To prevent the introduction of the cherry fruit-fly [*Rhagoletis cerasi*, L.] into England and Wales during the season of 1934, importation of cherries grown in Spain or France is prohibited after

27th May, except those grown within a small district round Honfleur. Cherries grown in Italy will not be admitted after 12th June, except those grown in the Region of Emilia, which will be admitted till 23rd June. Cherries grown in Germany will not be admitted after 26th June, except those certified not to have been grown south of 53°N. Lat. or in East Prussia. Certificates of origin must accompany cherries grown in any European country imported after 27th May.

KADEN (O. F.). **Die Bekämpfung des Kakaothripses unter neuzeitlichen Gesichtspunkten mit Berücksichtigung der Verhältnisse in San Tomé, Golf von Guinea.** [The Control of the Cacao Thrips from modern Points of View with Regard to Conditions in San Thomé, Gulf of Guinea.]—*Tropenpflanzer* **37** no. 4 pp. 139–148, 6 refs. Berlin, April 1934.

Most of this information on the control of *Selenothrips* (*Heliothrips*) *rubrocinctus*, Giard, on cacao in San Thomé is similar to that already noticed [*R.A.E.*, A **19** 54]. In 1930–1932, infestation in all plots treated with chemical potash manures decreased remarkably and in a short time. Similar results were obtained by using only 3 oz. potash per tree, with the addition of stable or compost manure. Of a number of proprietary insecticides tested, one containing resins had an adhesiveness enabling it to remain effective even in slight rain and would therefore be useful at the beginning of the dry season against localised centres of infestation.

During a visit to Costa Rica in 1932, the author found large numbers of this thrips on cacao apparently killed by a parasite, and a sudden cessation of outbreaks was said to have been noticed on previous occasions.

RIPLEY (L. B.) & PETTY (B. K.). **The Wattle Bagworm Problem.**—*Fmg in S. Afr.*, 1934, reprint no. 14, 2 pp. [Pretoria] March 1934.

The possibility of controlling *Acanthopsyche junodi*, Heyl. [*R.A.E.*, A **21** 35] in wattle plantations in South Africa is discussed, and cultural measures are summarised [**15** 19]. Large trees of green wattle [*Acacia decurrens* var. *normalis*] appear to be more resistant than black wattle [*A. mollissima*], but a strain adapted to the former might develop if it were grown exclusively. Indigenous parasites are much more prevalent on native *Acacia* than in wattle plantations, where they usually cause only 3 per cent. mortality, though 10 per cent. has been recorded on trees up to about 8 ft. high. Attempts are being made to introduce foreign species. The application of sodium chloride to the soil [*cf.* **21** 35 ; etc.] was found to be ineffective. In continued work with dusts, natural cryolite has proved the best in toxicity, adhesiveness and the nature of the dust cloud formed, besides being the cheapest. It is estimated that, to kill 90 per cent. or more of the larvae, 15–45 lb. should be applied per acre against the first two instars, 30–100 lb. against the third and 45–135 lb. against the last two, the quantities varying according to the size of the tree. The cost, which would probably approximate to 10*s.* an acre at the rate of 30 lb., would probably be prohibitive for the amount required against large bagworms on big trees. Applications should be made as soon after hatching as possible. Rainfall greatly reduces the effectiveness of the treatment,

but 65 per cent. mortality has been obtained when rain fell almost daily for two weeks after dusting, including the first day. Satisfactory control can probably be achieved by the use of all the measures available.

Ripley (L. B.) & Hepburn (G. A.). **Incompatibility of Molasses with Sodium Fluosilicate and Lead Arsenate.**—*Sci. Bull.* [*Dep. Agric. S. Afr.*] no. 130, 2 pp., 1 graph, 4 refs. [Pretoria, 1934.]

Experience in Natal has shown that the impurities in treacle, a typical analysis of which is given, may lower the toxicity of poison-baits. Its use is thought to have been responsible for conflicting results obtained with lead arsenate and sodium fluosilicate in bait-sprays against *Ceratitis* (*Pterandrus*) *rosa*, Ksh. [*cf. R.A.E.*, A **19** 707]. In experiments, treacle (7·6 per cent.), as compared with white sugar (6·25 per cent.), nullified the action of sodium fluosilicate (0·14 per cent.) and considerably reduced that of lead arsenate (0·14 per cent.). It is probable that this is due to the presence of lime [*cf. R.A.E.*, A **21** 36, 78], which in the treacle occurs mainly as calcium sucrate. White sugar should be substituted for treacle and brown treacle sugars in all formulae containing fluosilicates or arsenicals until it is proved in each instance that these materials are not responsible for appreciable loss in toxicity.

Delord (A.). **Report on the Operations for the Control of *Phytalus smithi*, Arrow during the Season 1932–33.**—6 pp. Mauritius, 1933. [Recd. May 1934.]

The position as regards *Lachnosterna* (*Phytalus*) *smithi*, Arrow, on sugar-cane in Mauritius in 1932–33, when about 327 million beetles were destroyed, compared favourably with the preceding year [*R.A.E.*, A **21** 220]. Infestation continued to increase, however, in two centres, despite an abundance of parasites. The two chief Scoliid parasites, *Tiphia parallela*, Smith, and *Campsomeris* (*Elis*) *thoracica*, F., were recorded in appreciable numbers in certain areas, and 1,645 females of the former were liberated on several estates. Attempts have been made to colonise *C.* (*E.*) *pilosella*, Sauss., originally obtained from Madagascar [**21** 644], in numerous places, but no evidence of its establishment has been obtained.

James (H. C.). **A new Mealybug (Coccidae) from Coffee in East Africa.**—*Stylops* **3** pt. 5 pp. 105–107, 1 fig. London, 15th May 1934.

Pseudococcus concavocerarii, sp. n., is described from the foliage and green stems of *Coffea arabica* in Tanganyika Territory and Kenya. Larvae and puparia of the predacious Agromyzid, *Leucopis* (*Leucopella*) *africana*, Mall. [*cf. R.A.E.*, A **15** 279] were found among the mealybugs.

Wilkinson (D. S.). **On some Microgasterinae (Hym., Brac.).**—*Stylops* **3** pt. 5 pp. 118–120. London, 15th May 1934.

Descriptions are given of the adults and cocoons of *Microgaster lepelleyi*, sp. n., bred from the Geometrid, *Epigynopteryx ansorgei*, Warr., in Kenya, and of *Microplitis demolitor*, sp. n., from *Heliothis obsoleta*, F., on tobacco in Queensland. *Microplitis radicalis*, Wlkn. [*R.A.E.*, A **17** 656] is referred to the genus *Snellenius*.

GOIDANICH (A.). **Materiali per lo studio degli Imenotteri Braconidi. II.** [Materials for the Study of Braconidae. II.]—*Boll. Lab. Ent. Bologna* **6** (1933) pp. 209–230, 9 figs., 30 refs. Bologna, 10th April 1934.

Descriptions are given of the abdominal morphology of *Lysiphlebus janinii*, Quilis [*R.A.E.*, A **19** 499] and of the adults and cocoon of *Menozzia formicaria*, gen. et sp. n., which was found in Umbria, Italy, in a nest of *Lasius fuliginosus*, Latr., the host being unknown.

PAOLI (G.). **Note su alcuni** *Heteronychus* **(Col. Dynast.) e descrizione di nuove specie.**—*Boll. Soc. ent. ital.* **66** no. 4 pp. 46–57, 6 figs., 13 refs. Genoa, 30th April 1934.

A further description is given of *Heteronychus sacchari*, which was described as new by the author in work recently noticed [*R.A.E.*, A **22** 308]. The adults of this Dynastid were found in Italian Somaliland attacking sugar-cane below the surface of the ground.

DE FRANCOLINI (J.), RÉGNIER (P. R.) & RUNGS (C.). **La pyrale des pommes** (*Carpocapsa pomonella*, **L.).**—[*Publ.*] *Déf. Vég. Dir. gén. Agric. Comm. Colon.* [*Morocco*] no. 8, 16 pp., 1 pl. Rabat, December 1933. [Recd. May 1934.]

A general account is given of the bionomics and control of *Cydia* (*Carpocapsa*) *pomonella*, L., together with a list of its natural enemies in various parts of the world and a calendar for the application of control measures in Morocco. In that country it probably has three generations a year, some of the larvae of the first and second and all those of the third overwintering.

BUSCK (A.). *Tortilia viatrix*, **new Species. An African Moth on Senna imported into the United States.**—*Proc. ent. Soc. Wash.* **36** no. 3 pp. 68–70, 1 pl. Washington, D.C., March 1934.

Sacks of dry senna leaves (*Cassia* sp.) from the Sudan that had been stored in New Jersey for 1½–3 years were found in September 1933 to be heavily infested with the larvae of *Tortilia viatrix*, sp. n., the adults of which are described. Larvae, pupae and adults were abundant on or near the sacks, and the considerable numbers of dead moths found on the floor of the warehouse and in corners indicated that several generations had developed. The infested material has apparently been successfully fumigated, and the chances of the continued survival and spread of this Tineid are remote. Other consignments of senna from India compressed in bales were apparently free from infestation.

MARLATT (C. L.). **Report of the Chief of the Bureau of Entomology, 1933.**—47 pp. Washington, D.C., U.S. Dep. Agric., 1933.

An account is given of the work of the United States Bureau of Entomology during the year ending 30th June 1933, some of which has been previously noticed. Shipments of parasites included *Angitia* (*Dioctes*) *molestae*, Uch., and *Trichogramma euproctidis*, Gir., to Argentina, *Glypta rufiscutellaris*, Cress., and *Pristomerus ocellatus*, Cush., to Japan, and *Macrocentrus ancylivora*, Roh., to Italy, all against the oriental fruit moth [*Cydia molesta*, Busck] ; *Diachasma fullawayi*, Silv.,

D. tryoni, Cam., *Opius humilis*, Silv., and *Tetrastichus giffardianus*, Silv. [from Hawaii] to Australia against the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], and the three last-named to California as possible parasites of *Rhagoletis suavis completa*, Cress. (walnut husk-fly); *Phanerotoma tibialis*, Hald., to New Zealand against the codling moth [*Cydia pomonella*, L.]; *Aphelinus mali*, Hald., to Ecuador against the woolly apple aphis [*Eriosoma lanigerum*, Hsm.]; *Trichogramma minutum*, Riley, to Canada; and *Compsilura concinnata*, Mg., to Barbados. A small colony of *Bathyplectes curculionis*, Thoms., obtained in the spring from Nevada was liberated in California against the alfalfa weevil [*Hypera variabilis*, Hbst.] and has become established. *Microbracon brevicornis*, Wesm., and *Pimpla* (*Exeristes*) *roborator*, F., readily attacked the pink bollworm [*Platyedra gossypiella*, Saund.] in Texas [*cf. R.A.E.*, A **21** 141], whence the former was sent in July to Mexico, where infestation of cotton occurs earlier. Small numbers of *M. mellitor*, Say, *M. platynotae*, Cush., *Elasmus setosiscutellatus*, Cwfd., *Zatropis incertus*, Ashm., and *Perisierola* sp. were reared in the spring from *P. gossypiella*, for the first time in Texas, largely from larvae feeding in the flowers of cotton.

Nicotine sulphate (1 : 1,000) gave 19 per cent. control of the pecan nut case-bearer [*Acrobasis caryae*, Grote] when used with Bordeaux mixture (3 : 4 : 50), 91, 92 and 94 per cent. with 3 different white-oil emulsions at strengths of 0·75 per cent., and 90 per cent. with fish oil at 0·25 per cent. In central Texas, infestations were reduced by 82 and 96 per cent. without injury to the foliage by lead arsenate (3 lb. to 50 U.S. gals.), which has not proved satisfactory in southern Georgia. Iron sulphate greatly enhances the effectiveness of lime-sulphur against the rust mite [*Phyllocoptes oleivorus*, Ashm.] on *Citrus* in Florida. The cost of treatment of *Citrus* against *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., in California has been reduced and its efficiency increased by the adoption of a "skeleton spray," which consists of a thorough application of oil concentrated on the outside of the tree, followed later by fumigation. In the Antelope Valley of California [*cf.* **22** 219, etc.], it has been found that comparatively small numbers of sexual females of the pea aphis [*Macrosiphum onobrychis*, Boy.] appear on lucerne late in spring and lay eggs that are resistant to desiccation and aestivate throughout the hot, dry summer. It was not previously known how the Aphid survived this period in the Valley.

Wireworms have been successfully controlled in the irrigated areas of the Pacific Northwest by the injection of 1 oz. carbon bisulphide to a depth of about 4 ins. at intervals of about 18 ins. or by mixing crude naphthalene into the upper 10 ins. of soil at the rate of 800 lb. per acre, the latter giving 85–95 per cent. mortality in test plots. Treatment should be made when the soil is in a good state of tillage and its temperature is above 70°F. Carbon bisulphide is about twice as expensive, but more effective, affording protection for at least 3 years. A high mortality may also be obtained by flooding after harvest if the temperature is fairly high, or by keeping the humidity of the soil at or below 90 per cent. within 1 foot of the surface for several weeks every 4–5 years. Satisfactory results were obtained against the sand wireworm [*Horistonotus uhleri*, Horn] in South Carolina, where it has one generation annually, by clean cultivation of the fields for 60 days or more during February–April, except on cotton, the roots of which appear to remain sufficiently succulent to support the larvae.

The situation as regards the boll weevil [*Anthonomus grandis*, Boh.] is discussed, together with experiments for its control on cotton, chiefly by means of calcium arsenate dusts. Parasitism in Louisiana in 1932 averaged a maximum of less than 10 per cent., of which 90 per cent. was due to *M. mellitor*, other species reared being the Pteromalids, *Catolaccus incertus*, Ashm., and *C. hunteri*, Cwfd., *Eurytoma tylodermatis*, Ashm., and *Eupelmus cyaniceps*, Ashm. As a result of continuous experimental breeding on cotton for 7 years, the thurberia weevil [*A. grandis thurberiae*, Pierce] appears to be becoming adapted to cotton, on which it has 2 or more generations. The adults, however, unlike those of the typical form, hibernate in the pupal cells in the bolls.

Liberations were made in various States of the following parasites obtained from Europe : 1,650 females of *Petalodes* (*Rhogas*) *unicolor*, Wesm., which reproduces parthenogenetically, against the satin moth [*Stilpnotia salicis*, L.] in New England ; 156,500 adults of the Encyrtid *Copidosoma geniculatum*, Dalm., from Austria and 121,450 of *Tetrastichus turionum*, Htg., against the European pine shoot moth [*Rhyacionia buoliana*, Schiff.] in Massachusetts, Connecticut, New York and Pennsylvania, evidence being subsequently obtained of the development of one generation of this Eulophid ; 1,300 females of *Chrysocharis* sp. and 500 of *Phanomeris phyllotomae*, Mues. [**20** 464] against *Phyllotoma nemorata*, Fall. (birch sawfly) in Maine ; 1,399 males and 1,639 females of *C. laricinellae*, Ratz., from Austria against the larch case-bearer [*Coleophora laricella*, Hb.] in Maine, New York and Massachusetts ; and about 1,300 adults of *Tetrastichus* sp. and *T. xanthomelaenae*, Rond., against the elm leaf-beetle [*Galerucella luteola*, Müll.] in California, Virginia, the District of Columbia and Massachusetts.

In California, *Ephestia figulilella*, Gregson [*cf.* **21** 44, 516; etc.] has recently become a major pest of dried fruit. Figs, peaches and grapes are infested during or immediately after the drying process and before they are stored ; in 1932, a loss of over £43,000 [at par] was caused by depreciation in the quality of figs alone. Large numbers of larvae emerged from the figs in storage to seek places for pupation, but it was found that conditions were not suitable for the development of succeeding generations. Figs protected during drying with tobacco shade cloth showed little or no infestation, as compared with up to 60 per cent. in fruit handled according to the prevailing practices. The first crop of figs is considered unimportant and is commonly harrowed into the soil mulch. It has been found, however, that the larvae that have hibernated in the soil beneath the trees continue to develop on the partly desiccated figs. Large populations were discovered to develop in the fruit of mulberries grown for shade, which ripen before figs.

Flint (W. P.) and others. **Entomology Investigations.**—*Rep. Illinois agric. Exp. Sta* **46** (1932–33) pp. 137–163, 4 figs. Urbana, Ill., 1933. [Recd. May 1934.]

Work against insect pests in Illinois during the year ending 30th June 1933 is reviewed. Rotation of crops so that clover precedes maize has greatly reduced infestation of the latter by insects, including the corn rootworm [*Diabrotica longicornis*, Say] and the corn root aphis [*Anuraphis maidiradicis*, Forbes], which both cause serious losses annually.

An autumn survey in the southern part of the State showed that for economy the treatment of peach trees with paradichlorobenzene against the peach tree borer [*Aegeria exitiosa*, Say] may be safely omitted for one year but not for two, and that grass and weeds need not be removed before treatment. *Macrocentrus ancylivora*, Roh., was liberated in 14 peach-growing counties against the oriental fruit moth [*Cydia molesta*, Busck], which infested 5–42 per cent. of the fruit and was considerably more injurious than in any year since its appearance in the State [*R.A.E.*, A **17** 479], but the parasite was only recovered where it had been liberated in the previous year. An oil-impregnated dust of 60 parts sulphur, 25 parts lime, 10 parts lead arsenate and 5 parts oil proved to be the most efficient, economical and harmless substitute for a spray of 3 lb. lead arsenate and 3–12 lb. hydrated lime in 100 U.S. gals. against pests of peach. Severe injury was caused by the lead arsenate in the spray if less than 6 lb. lime was used.

The scurfy scale [*Chionaspis furfura*, Fitch] was found in most raspberry plantations during the first survey of this crop carried out in the extreme south in the autumn. The commonest insects were termites, which do not attack the plants ; injury by them to the stakes may be prevented by treating the ends with creosote. Though about 50 per cent. of the strawberry flowers may be prevented from pollination by thrips, many of them do not normally mature fruit, and the reduction did not greatly decrease the crop. The population was greatest late in the season when the strawberry blooms were less numerous. The application against the onion thrips [*Thrips tabaci*, Lind.] of nicotine sulphate or derrisol, each at the rate of 1 to 800 parts of a solution of penetrol and water (1 : 200) increased the yield of onions by 24 per cent. A dust of calcium arsenate and gypsum (1 : 15) was the most satisfactory of several tested against cucumber beetles [*Diabrotica*] on cucurbits.

Commercial damage may be caused to mushrooms by *Tyroglyphus lintneri*, Osb., and *Linopodes motatorius*, L. (*antennaepes*, Banks), both of which may be controlled by fumigation and proper cultivation, and by *Chortoglyphus* (*Histiostoma*) *gracilipes*, Banks, which is recorded for the first time on mushrooms, to which it causes severe injury, feeding on the spawn [*cf.* **22** 287]. This mite completes its life-cycle in $4\frac{1}{2}$–$5\frac{1}{2}$ days at 70° F. It reproduces parthenogenetically, each female depositing 150–320 eggs during 2–3 weeks, over 50 per cent. of which are laid during the first 4 days. Under adverse conditions, the nymphs readily enter the hypopial stage, which may occupy 6–8 months and during which they do not feed and are resistant to fumigants. They are then able to attach themselves to workers' clothing or to the legs and hairs of flies and other insects, by which they may be carried to favourable situations, where they feed within 24 hours and oviposit within 36. The heat and moisture present in the house after the beds are filled with compost render the nymphs active within 24 hours and drive them on to straws, side boards or posts, where they may be killed by fumigation with hydrocyanic acid gas. Flies, which are responsible for re-infestation by mites, may be prevented from entering the house when it is being cooled for spawning by covering all openings with copper screening (30 meshes per inch). The clothing of men engaged in picking mushrooms should be changed before spawning new beds, the set not in use being kept in steel compartments containing paradichlorobenzene crystals.

Tests showed that a nicotine spray is more effective against the Mexican mealybug [*Phenacoccus gossypii*, Tns. & Ckll.], which caused the loss of up to 50 per cent. of the chrysanthemum crop in some greenhouses, when it is heated to 120°F., especially where only low-pressure equipment is available.

KNOWLTON (G. F.). [**Insect Pests in Utah.**]—*Leafl. Utah agric. Exp. Sta.* nos. 8, 9, 21, 22, 28, 33, 36. 7 nos., illus. Logan, Utah, 1934.

Of these leaflets [*cf. R.A.E.*, A **22** 68], No. 8 deals with *Eutettix tenella*, Baker [**19** 18; **20** 470, etc.], which has caused enormous losses to the sugar-beet industry through the transmission of curly-top disease. Insecticides have proved costly and ineffective. In northern Utah, beets planted early are less severely affected. No. 9 contains information on *Pieris rapae*, L., which is the chief pest of cabbage in the State, having 3–5 overlapping generations annually. The residue from arsenical dusts or sprays [*cf.* **14** 409] will remain within the tolerance [0·01 grain As_2O_3 per lb.], provided that only 1¼–1½ lb. Paris green or 2½–3 lb. lead or calcium arsenate is applied per acre. Up to 6–8 dustings should be given, the last not later than 2 weeks before harvest. No. 21 deals with cutworms, and No. 28 with ants, the usual measures being recommended for their control.

In No. 22, it is stated that *Eurycephalomyia myopaeformis*, Roeder (*Tetanops aldrichi*, Hendel) [*cf.* **11** 78], which is of rather local distribution in Utah, though apparently indigenous, causes the most severe damage to sugar-beet during July–August. Proper cultural conditions and a liberal supply of water [*cf.* **13** 505] appear to aid the plants in withstanding anything but a very serious attack. Cultivation during late May and early June will expose the pupae to the sun and to the attacks of natural enemies. No. 33 contains an account of *Heliothis obsoleta*, F., as a pest of maize. The larvae hatch in 2–8 days and feed for 13–28, undergoing a pupal period of about 2 weeks in the soil. Oviposition is greatest during June and the latter part of July and August, though it may continue until the frosts occur. No. 36 deals with *Paratrioza cockerelli*, Šulc [**19** 556; **21** 650; etc.]. Potato plants should be sprayed or dusted before serious damage occurs, and early potatoes sometimes require treatment on or before 15th June. Among insecticides mentioned [*cf.* **22** 128], sprays of 1 U.S. gal. summer miscible oil (preferably with the addition of 5–7 lb. fish-oil soap) in 100 U.S. gals. water or of 1 U.S. pint nicotine sulphate, 5 lb. fish-oil soap and 99 U.S. gals. water are effective against the nymphs.

PROPER (A. B.). **Hyperparasitism in the Case of some introduced Lepidopterous Tree Defoliators.**—*J. agric. Res.* **48** no. 4 pp. 359–376, 9 refs. Washington, D.C., 15th February 1934. [Recd. May 1934.]

As hyperparasites have been considered responsible for the reduction of parasites introduced into the United States against Lepidopterous forest pests, collections were made during 1929–32 in certain localities in New England of cocoons or puparia of such parasites. Data concerning the hyperparasites discovered and their relative importance are given in tables and discussed.

The following is largely taken from the author's summary, only the more important hyperparasites being mentioned, in order of their

abundance : *Eupteromalus nidulans* (Först.) Thoms. [*cf. R.A.E.*, A **19** 655] was chiefly responsible for 5 per cent. parasitism of the cocoons of *Apanteles lacteicolor*, Vier., which are formed in the webs of the overwintered larvae of *Nygmia phaeorrhoea*, Don., about 10 days after they have begun to feed ; adults of *Apanteles* emerged from about 55 per cent. of the cocoons. About 32 per cent. of the cocoons of the first generation of *A. melanoscelus*, Ratz., a larval parasite of *Porthetria dispar*, L., were parasitised by *Eurytoma appendigaster*, Swed., *Hemiteles tenellus*, Say, *Gelis bucculatricis*, Ashm., and *Diabrachys cavus*, Wlk. (*boucheanus*, Ratz.), and about 84 per cent. of the second (of which 10 per cent. emerged) by *E. appendigaster*, *D. cavus* and *G. bucculatricis*. Cocoons of *A. solitarius*, Ratz., a parasite of *Stilpnotia salicis*, L., showed 27 and 20 per cent. parasitism in the winter and summer, with 50 and 64 per cent. adult emergence, respectively ; *D. cavus* was the most important species, but *Eupteromalus nidulans* was also fairly abundant in the second generation. Adults of *Meteorus versicolor*, Wesm., a parasite of *N. phaeorrhoea*, emerged from 60 per cent. of the cocoons, 30 per cent. being parasitised, chiefly by *H. tenellus* and *Eurytoma appendigaster*. *Eupteromalus nidulans* is also a primary parasite of *S. salicis* and to a less extent of *N. phaeorrhoea*, in which capacity it experienced 19 per cent. parasitism, principally by *Pleurotropis nawaii*, Ashm.

The percentage of hyperparasitism in the case of *Compsilura concinnata*, Mg., parasitic on *N. phaeorrhoea* was about 59, chiefly by *Monodontomerus aereus*, Wlk. [*cf.* **20** 58], *Eurytoma appendigaster*, *D. cavus* and *Brachymeria compsilurae*, Cwfd ; on *P. dispar*, about 16, largely by *D. cavus* and *B. compsilurae* ; and on *S. salicis*, about 44, by *B. compsilurae*, *Phygadeuon subfuscus*, Cress., *D. cavus* and *Psychophagus omnivorus*, Wlk. About 23 per cent. of the puparia of *Sturmia nidicola*, Tns., which is practically specific to *N. phaeorrhoea* in New England, were parasitised, mostly by *M. aereus* and *B. compsilurae*, adults emerging from 40 per cent. Of puparia of *S. scutellata*, R.-D., parasitic on *P. dispar*, about 11 per cent. produced hyperparasites, including *B. compsilurae* and *Conostigmus* (*Megaspilus*) *virginicus*, Ashm., about 38 per cent. of the adults emerging. *B. compsilurae* and *Monodontomerus aereus* were partly responsible for 11 per cent. parasitism of *Carcelia laxifrons*, Villen., attacking *N. phaeorrhoea*. One of the three puparia of the native primary parasite, *Tachina mella*, Wlk., parasitising *N. phaeorrhoea*, was killed by *M. aereus*.

Puparia of *Chaetexorista javana*, Br. & Berg., recently liberated against *Monema* (*Cnidocampa*) *flavescens*, Wlk. [**21** 233] were free from parasites, though a single puparium obtained in Massachusetts in 1930 had contained adults of *Melittobia* sp.

FULTON (R. A.) & CHAMBERLIN (J. C.). **An improved Technique for the Artificial Feeding of the Beet Leafhopper with Notes on its Ability to synthesize Glycerides.**—*Science* **79** no. 2050 pp. 346–348, 2 figs., 7 refs. New York, 13th April 1934.

An apparatus is described for feeding simultaneously large numbers of *Eutettix tenella*, Baker, previous devices [*R.A.E.*, A **20** 471] having been intended for individual insects. The nutrient solution is poured into a shallow vessel capped with a mesentery membrane through an L tube (which projects from the side of the vessel, so that the top of the vertical arm is higher than the surface) till the liquid is in contact with

the entire surface of the membrane. The tube is then corked to prevent contamination. The vessel may be washed and sterilised in alcohol without removing the membrane or impairing its efficiency. The leafhoppers are fed in a cage consisting of a 3-inch cylinder of $1\frac{5}{8}$-inch glass tubing, capped at both ends with a fine open-mesh cloth, which is placed upright on the membrane surface. It is thus possible to transfer feeding insects from one solution to another without handling them. From 25 to 50 leafhoppers may be confined in this cage without apparent overcrowding.

Experiments carried out to ascertain whether *E. tenella* is able to build up or maintain fat reserves from pure sugar solutions showed that it is capable of synthetising glycerides when fed only on glucose and fructose. A pure sugar diet, however, shortened the life of the insects.

HASEMAN (L.). **The Codling Moth Problem in Missouri.**—*Bull. Missouri agric. Exp. Sta.* no. 334, 16 pp., 4 figs., 2 refs. Columbia, Mo., April 1934.

As a result of experiments in 1933 on the codling moth [*Cydia pomonella*, L.], which has increased particularly during the last 4 years in Missouri, recommendations are given for its control, chiefly by means of carefully timed lead arsenate sprays [*cf. R.A.E.*, A **16** 24, 453; **21** 651], to which should be added 1 U.S. gal. summer oil in the 2nd and 3rd cover sprays and lime (in at least equal parts) to prevent scorching where no fungicide is used. The usual supplementary control measures are given.

ESSIG (E. O.) & MICHELBACHER (A. E.). **The Alfalfa Weevil.**—*Bull. Calif. agric. Exp. Sta.* no. 567, 99 pp., 16 figs., 12 pp. refs. Berkeley, Calif., December 1933. [Recd. May 1934.]

In view of the occurrence of *Hypera* (*Phytonomus*) *variabilis*, Hbst., on lucerne in California, in the San Francisco Bay region and the extreme northern part of the San Joaquin Valley [*cf. R.A.E.*, A **20** 644; **21** 516], a comprehensive account is given from the literature of its world distribution, appearance and bionomics (including natural enemies and relation to climate) and of measures practised for its control.

HERMS (W. B.). **Control and Prevention of the Western Subterranean Termite.**—3 pp. Berkeley, Calif., Agric. Exp. Sta. [1934.]

A brief account is given of the life-history and control of *Reticulitermes hesperus*, Banks, the most widely distributed termite in California and probably the most destructive to structural timber.

PARK (T.). **Observations on the general Biology of the Flour Beetle, *Tribolium confusum*.**—*Quart. Rev. Biol.* **9** no. 1 pp. 36–54, 5 figs., 39 refs. Baltimore, March 1934.

Experimental work that has been already done with *Tribolium confusum*, Duv. [*R.A.E.*, A **21** 314, etc.] is reviewed, and some observations on the behaviour of the adults are recorded. Apparatus for breeding the beetle is described and a diagram given of an electric automatic flour-sifter used by the author.

YOUNG (P. A.). **Fungi and Bacteria as Indicators of the Effects of Petroleum Oils on Apple Leaves.**—*Phytopathology* **24** no. 3 pp. 266–275, 2 figs., 13 refs. Lancaster, Pa, March 1934.

Various tests are described by which fungi can be used to predict the toxic effect of petroleum oils on apple leaves. Both leaves and fungi generally tolerated oils containing less than 11 per cent. sulphonatable material. Sulphonatable chemicals differed in their effects on different organisms. The bacteria tested grew too slowly and indistinctly under oils to be of value in indicating the effect on apple leaves.

VAN STEENBURGH (W. E.). ***Trichogramma minutum* Riley as a Parasite of the Oriental Fruit Moth (*Laspeyresia molesta* Busck) in Ontario.**—*Canad. J. Res.* **10** no. 3 pp. 287–314, 6 graphs, 16 refs. Ottawa, March 1934.

Cydia (*Laspeyresia*) *molesta*, Busck, is parasitised in Ontario by a native yellow race of *Trichogramma minutum*, Riley, but field observations on peach and quince in 1928–33 [*cf. R.A.E.*, A **21** 284; etc.] showed that it is not normally an important factor in control. Apparently the parasite cannot overwinter in the fragile eggs of this host. Field and laboratory studies showed that this race has a possible 8 generations before the peaches are harvested, whereas a grey race obtained from Louisiana and California has a possible 6. The maximum oviposition of the yellow race occurred at about 60°F. and that of the grey race at about 70°F. Below 70°F., females of the yellow race showed grey markings, which became darker at lower temperatures. A native dark race [*loc. cit.*] was found unsuitable for use against *C. molesta*. Each of these races appeared to be biologically distinct, and attempts to cross-fertilise them failed [*cf.* **22** 315].

Parasitised eggs of *Ephestia kühniella*, Zell., were successfully stored for 75 days at 35–40°F., but the emerging females laid only half the normal number of eggs. A healthier stock was obtained by rearing at a little over 55°F. so as merely to retard development.

Adults of the grey race were more active than the yellow ones, took wing more readily and dispersed more rapidly. Experiments showed that light was the chief stimulus. The insects generally flew against a wind with a velocity of 1 mile per hour or less; when the velocity reached nearly 3 miles, they were carried before it. Rain retarded the spread of the parasites in the orchard, but as they sheltered under leaves they were not usually harmed by it. The adults had no important natural enemies, but Chrysopid larvae [*cf.* **20** 513] destroyed many parasitised eggs. Oil sprays or hydrated lime dusts repelled ovipositing females.

Figures are given showing the percentages of parasitism obtained in a number of experimental liberations in peach orchards. Under favourable weather conditions and where infestation was heavy, parasitism was materially increased, but in general the results were not dependable. When the host was scarce, it was not possible to increase parasitism appreciably even by liberating large numbers.

JACKSON (D. J.). **Parasites of Weevils of the Genus *Sitona*.**—*Scot. Nat.* **207** pp. 75–79, 3 refs. Edinburgh, 1934.

Further parasites of weevils of the genus *Sitona* [*cf. R.A.E.*, A **16** 621] observed by the author are a Tachinid larva from *S. hispidula*, F.,

from Ontario, and Protozoa of the genus *Mycetosporidium* from *S. hispidula*, a Microsporidian and a Mermithid from *S. lineata*, L., and the fungi, *Entomophthora coleopterorum* from *S. hispidula*, *S. sulcifrons*, Thnb., and *S. flavescens*, Marsh., and *Metarrhizium anisopliae* from larvae of various species, all from various parts of Britain.

GREEN (E. E.). **Observations on British Coccidae. xiv.**—*Ent. mon. Mag.* **70** no. 840 pp. 108–114, 3 figs. London, May 1934.

Notes are given on a number of Coccids found in Britain. *Lecanium corni* var. *crudum*, Green, has been causing serious injury to yew [*cf. R.A.E.*, A **18** 229]. Certain peculiarities, including the free production of winged males (which are rarely associated with the typical *L. corni*, Bch.), suggest that this variety may be developing into a physiological species. The author has never observed the typical *L. corni* on yew, even when it was infesting peach and other trees in the vicinity. *L. zebrinum*, Green [**6** 59], has been found to be a synonym of *L. douglasi*, Šulc, the food-plant being birch (*Betula alba*). *Pseudococcus newsteadi*, Green, has recently been seen on a close-clipped beech hedge. *Chionaspis dysoxyli*, Mask., which is redescribed, was found on the lower surface of leaves of *Dysoxylon spectabile* originating from New Zealand ; this is the first record of this species in England.

A list of the Coccids recorded from Ireland is appended.

MACGILL (E. I.). **On the Biology of** *Anagrus atomus* **(L.) Hal. : an Egg Parasite of the Leaf-hopper** *Erythroneura pallidifrons* **Edwards.**—*Parasitology* **26** no. 1 pp. 57–63, 11 figs., 7 refs. Cambridge, May 1934.

All stages are described of *Anagrus atomus*, L., reared from eggs of *Erythroneura pallidifrons*, Edw., on *Primula* and greenhouse plants [*cf. R.A.E.*, A **20** 333], chiefly at Manchester. This Mymarid can reproduce parthenogenetically, at least during the greater part of the year. The females, which may begin to oviposit as soon as they emerge, appear to lay only a small number of eggs ; 5–6 may be deposited in a single host egg, but only one adult emerges from it. The older larvae are often coloured a bright red, which enables parasitised eggs to be easily recognised in the leaf tissue. They pupate in the host eggs. At 28–27°C. [78·7–80·6°F.], the life-cycle generally occupied 16 days. There are many generations a year.

STANILAND (L. N.). **The Loganberry Cane Maggot.**—*J. Minist. Agric.* **41** no. 2 pp. 151–153, 1 pl., 5 refs. London, May 1934.

A peculiar wilting of the tips of young loganberry canes in South Devon in early June 1933 was found to be due to maggots boring inside the stems. After boring downwards for some inches, they girdled the shoot and also made a small hole to the outside, thus causing the wilting. They then bored further down the canes, which had sometimes to be cut back as much as 2 feet to find them. Only young canes were attacked. As it is thought that the species involved may be *Phorbia rubivora*, Coq. (raspberry cane maggot), which is a serious pest in the United States and Canada, an outline is given of the life-history of this Anthomyiid [*cf. R.A.E.*, A **7** 5 ; **8** 208]. A species of *Phorbia* was recorded by Theobald as attacking raspberry [*cf.* **2** 563], loganberry and blackberry in England in 1912 and 1913. Infested shoots should be cut well below the wilting and burnt.

EDWARDS (E. E.). **Control of the Cabbage Root Fly.**—*J. Minist. Agric.* **41** no. 2 pp. 154–161. London, May 1934.

Further trials of mercury bichloride and naphthalene against the cabbage root fly [*Phorbia brassicae*, Bch.] on cauliflower in England in 1932 and 1933 generally confirmed previous findings [*R.A.E.*, A **20** 255]. The results with naphthalene, however, were variable, and in 1933, probably owing to the abnormally dry season, they were unsatisfactory, so that treatment with mercury bichloride is considered more reliable. Observations in the course of this work showed that if transplanting were deferred until about the last week in June, the injury would be reduced to a minimum, and under commercial conditions it should be done as late as is practicable.

COLLIN (J. E.) & WAINWRIGHT (C. J.). **Some Diptera collected in the South of England in 1930–33.**—*J. Soc. Brit. Ent.* **1** pt. 1 pp. 17–28. Southampton, 10th May 1934.

The species recorded include the Anthomyiid, *Phorbia* (*Delia*) *pilipyga*, Villen., which has a wide distribution in Britain and has been bred from larvae attacking the roots of radishes.

DE FLUITER (H. J.). **Over de levenswijze van de gewone dennenbladwesp, *Diprion pini* (L.) en enkele harer voornaamste hymenoptere parasieten, de Chalcidide, *Closterocerus* spec. (ei-parasiet) en de Cryptide, *Microcryptus subguttatus* Grav. (coconparasiet).** [On the Life-history of the common Pine Sawfly and some of its chief Hymenopterous Parasites.]—*Levende Nat.* **38** no. 11 pp. 353–360, 7 figs.; **39** no. 1 pp. 28–33, 6 figs. Amsterdam, March & May 1934.

Much of the information given on the biology of the pine sawfly, *Diprion pini*, L., in Holland is similar to that already noticed [*R.A.E.*, A **20** 659; **22** 338].

The female of *Closterocerus* sp., the only egg-parasite found, followed the female sawfly and oviposited in the host egg as soon as it was laid. In this manner a row of sawfly eggs in a pine needle may become parasitised, and this Eulophid may thus be an important factor in control.

Microcryptus subguttatus, Grav., did not parasitise free larvae of *D. pini*, or prepupae or pupae removed from their cocoons. It paralysed a prepupa, pupa or adult about to emerge and deposited an egg on the wall of the cocoon [*cf.* **21** 382]. The newly emerged females contained mature eggs and soon mated, ovipositing immediately afterwards. From overwintered cocoons the parasites emerged between mid-April and mid-June, a second generation appearing in July and August. Experiments in parasitism are described in detail. Eggs laid on 15th June hatched after 3 days, and all the adults emerged before the end of July. Large numbers of the Eulophid, *Microplectron fuscipennis*, Zett. [*cf.* **20** 659] emerged from a cocoon that contained the remains of an adult female sawfly and of *Microcryptus*.

VAYSSIÈRE (P.). **La protection des stocks de blé contre les insectes.**—*C. R. Acad. Agric. Fr.* **20** no. 15 pp. 520–524, 4 refs. Paris, 1934.

In France, stored wheat is treated for the control of insect pests by fumigation with chloropicrin, carbon bisulphide or ethylene oxide

(which is particularly effective in combination with carbon dioxide), or by heating the granary to about 55°C. [131°F.] or keeping the bins hermetically sealed. Experiments were undertaken to determine the possible effect of this last procedure, which is considered the most satisfactory, on the grain. Three samples were stored in sealed containers for about 2 months, one with its natural moisture content of 11·8 per cent. and the others with 16 and 18 per cent. moisture respectively, and subjected to quick and considerable changes in temperature. A faint acid smell was noticeable at first in the lot having the maximum humidity, but the bread baked from all samples was indistinguishable.

Fagniez (C.). **Une invasion de *Chloridea peltigera* Schiff. Lépidoptère nuisible à la sauge sclarée, arrêtée par l'intervention de *Polistes gallicus* L. (Hymén.).**—*Rev. franç. Ent.* **1** pt. 1 pp. 27–28. Paris, 1934.

Polistes gallicus, L., controlled almost completely in less than 10 days a severe outbreak of *Heliothis* (*Chloridea*) *peltigera*, Schiff., in a field of clary (*Salvia sclarea*) in France. The wasps broke the caterpillars into pieces, and rolling these into small pellets took them one by one back to their nests as food for their developing larvae. These nests were situated under the roofs of large buildings about 50 yards from the infested field. Parasites reared from pupae of *H. peltigera* were the Tachinids, *Echinomyia fera*, L., and *Winthemia quadripustulata*, F., the Braconid, *Meteorus pulchricornis*, Wesm., and an Ichneumonid, *Hemiteles* sp.

Servadei (A.). **Contributo alla conoscenza dei Tentredinidi (Hymenoptera, Symphyta) delle rose. II.** *Arge pagana* **Panz.** [A Contribution to the Knowledge of Sawflies of Roses. II. *A. pagana*.]—*Boll. Lab. Ent. Bologna* **6** pp. 179–208, 18 figs. Bologna, 31st March 1934.

Arge pagana, Panz., all stages of which are described, sometimes causes considerable injury to roses in Italy. The larvae, which are gregarious [*R.A.E.*, A **18** 504], feed at first on the young leaves and then defoliate the plants. They prefer *Rosa canina* and the different varieties of *R. centifolia*. Adults from overwintered cocoons appeared towards the end of April. The eggs were laid in niches arranged along a slit $\frac{3}{5}$–$\frac{4}{5}$ in. long sawn by the female in young branches. The larvae of the first generation occurred during the month following the second week in May, and those of the second from about 10th July to early August. The third-brood larvae, which hatched out early in September, hibernated in cocoons in the soil.

The larvae were parasitised by the Tachinid, *Vibrissina turrita*, Mg., which was not very common, the adults emerging from 15th to 17th September, and by the Ichneumonid, *Mesochorus semirufus*, Hlmgr. The larvae of both parasites pupated in the host cocoons. Larvae of *Pteromalus* sp. (up to 25 in each) were found in sawfly larvae of all generations, especially the second, the pupae overwintering inside the host. The sawfly pupae were parasitised by *Tetrastichus atrocoeruleus*, Nees.

Servadei (A.). **Aggiunta alla nota su un nuovo Dittero Antomiide (*Hylemyia servadeii* Séguy) dannoso alle Iridacee del gen. *Iris*.** [An Addition to the Note on a new Anthomyiid injurious to *Iris*.]—*Bol. Lab. Ent. Bologna* **6** pp. 239–241, 2 figs. Bologna, 27th April 1934.

The distribution of the seven pairs of tracheal spiracles in the abdomen of the adults of both sexes of *Hylemyia servadeii*, Séguy, a pest of *Iris* in Italy [*R.A.E.*, A **22** 164], is described.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1933.** [A Review of Phytopathological Cases observed in 1933.]—*Bol. Staz. Pat. veg. Roma*, N.S. **14** no. 1 pp. 1–78. Rome, 1934.

Most of this report deals with fungus pests. The insects recorded include *Dacus oleae*, Gmel., which reappeared in abundance in central Italy after two years. In many plantations in Latium, about 50 per cent. of the larvae in the olives had been killed by *Eurytoma rosae*, Nees. In one district, about 600,000 trees were treated with a bait-spray containing molasses and sodium arsenite. In spite of an abundance of honey-dew and the occurrence of heavy rain, it reduced infestation as compared with that of untreated trees. Experiments with trap-jars were made to test the attractiveness of various additions to a commercial bait containing beet molasses and sodium arsenite. Ammonia and caustic soda gave an almost identical increase in attractiveness, and as ammonia is very volatile, the addition of 0·5 per cent. caustic soda to the bait-spray is suggested for experiment.

Bua (G.). **Esperimenti del 1933 con sostanze attrattive per la mosca delle olive.** [Experiments in 1933 with Substances attractive to the Olive Fly.]—*Ann. Ist. sup. agr. Portici* (3) **6** (1933) pp. 125–145, 5 refs. Portici, 18th April 1934.

In further experiments in Italy in 1933 [*cf. R.A.E.*, A **20** 383; **21** 440] with attractive substances for addition to molasses baits against the olive fly, *Dacus oleae*, Gmel., which are recorded in detail, the most effective bait was a preparation named Dacivoro D.F.O. containing 1 per cent. ammonium fluoride and 1 per cent. olive oil. Solutions of ammonium hydrate or ammonium nitrate alone, though initially much less attractive, remained attractive for a longer period than baits containing molasses. No reduction in their efficiency was noticed after 10 days.

Monterosso (B.). **Osservazioni e ricerche sperimentali sulla biologia di *Pediculoides ventricosus* (Newp.) Berl.** [Observations and experimental Investigations on the Biology of *P. ventricosus*.]—*Riv. Biol.* **16** no. 1 pp. 80–127, 1 fig., 26 graphs, 7 refs. Florence, February 1934.

A detailed account is given of the results of studies on sexual and parthenogenetic reproduction in *Pediculoides ventricosus*, Newp. [*cf. R.A.E.*, A **14** 564].

Kutter (H.). **Weitere Untersuchungen über** *Kakothrips robustus* **Uzel und** *Contarinia pisi* **Winn., sowie deren Parasiten, insbesondere** *Pirene graminea* **Hal.** [Further Investigations on *K. pisivorus* and *C. pisi* and the Parasites of the latter, especially *P. graminea*.]—*Mitt. schweiz. ent. Ges.* **16** no. 1 pp. 1–82, 56 figs., 18 refs. Berne, 15th March 1934.

In areas in the Canton of St. Gall that were infested in 1932 by *Kakothrips pisivorus*, Westw. (*robustus*, Uzel) and *Contarinia pisi*, Winn. [*cf. R.A.E.*, A **21** 374], pea-growing was prohibited in 1933. Observations in new fields showed that the adults of *K. pisivorus* emerged at the same date as in 1932, despite different weather conditions. No natural enemies could be found.

The minimum durations of the egg, larval and pupal stages of the first (June) generation of *C. pisi* were respectively 4, 10 and 11 days. As a rule there are two generations a year, but the later first-brood larvae probably overwinter, as do those of the second brood.

A detailed account is given of the morphology and biology of *Pirene graminea*, Hal., the eggs of which are laid in the larvae of *C. pisi* [*cf. loc. cit.*]. The primary larval stage of this Pteromalid develops on the material in its egg; this is followed by the secondary stage living at the expense of the host maggot, which finally dies of under-nourishment. The full-grown larva leaves its host and pupates in the cocoon. The adult emerges in the cocoon and works its way out of the ground. At room temperature, the life-cycle required a minimum of 24 days. There were two generations in the year, the second and some of the first overwintering in the primary larval stage. Females matured 40–60 eggs and could oviposit within 6 days of emergence. The adults prefer blossoms attacked by *K. pisivorus*; they feed on sweet secretions from them or punctures by the thrips. In the summer of 1933, up to 75 per cent. of the larvae of *C. pisi* collected were parasitised by *P. graminea*. No hyperparasites were found.

Of the Scelionid parasites observed in 1932 [*loc. cit.*], *Inostemma bosci*, Jur., was commoner in 1933, *Sactogaster pisi*, Först., was abundant in July, appearing with the summer generation of *Contarinia* (before that of *P. graminea*), and *Leptacis tipulae*, Kby., was not seen.

In the open plain, peas should not be grown within a kilometre of infested areas. Woods and hills form natural barriers to the spread of both pests, and in one instance an embankment 15 feet high provided effective protection. Evidence was obtained that trap-crops of peas could be used to intercept some of the adults migrating from an infested area.

C. pisi was never found except on peas, whereas *K. pisivorus* occurred also on other leguminous plants.

Ferrière (C.). **Note sur les Pireninae, avec descriptions de deux nouvelles espèces.**—*Mitt. schweiz. ent. Ges.* **16** no. 1 pp. 83–93, 3 figs. Berne, 15th March 1934.

This note includes a key to the genera of the Pteromalid subfamily Pireninae and a list of the species, showing their distribution and hosts where known.

Platecrizotes sudanensis, gen. et sp. n., is described from pupae of *Sesamia cretica*, Led., in the stems of *Sorghum* in the Anglo-Egyptian Sudan.

Pfeffer (A.). **Kůrovci ve Vysokých Tatrach.** [Bark-beetles in the High Tatra Mountains.]—*Lesn. práce* **11** reprint 23 pp., 6 graphs, 8 pls. Písek, 1932. (With a Summary in French.) [Recd. May 1934.]

Favourable conditions for outbreaks of bark-beetles in the forests of the High Tatra Mountains in Czechoslovakia are created by the severe cyclones that sometimes sweep over the region, breaking or uprooting great numbers of trees. Over five million cu. ft. of wood was thus destroyed in one district in 1925, and since it was impossible to clear all the fallen trees, etc., some of which were in inaccessible places, bark-beetles began to develop, and an outbreak occurred in 1930 and 1931. The topography and climate of the infested area are outlined, and the various types of stands and the associations of bark-beetles occurring in them are discussed.

In the vegetational zone at the foot of the mountains, which has gradually been transformed into a dry type by the grazing of cattle and injury to the trees by animals and man, the Scolytids prevailing on spruce were *Dendroctonus micans*, Kug., and *Ips* (*Pityogenes*) *chalcographus*, L., and to a less extent *Phloeophthorus* (*Phthorophloeus*) *spinulosus*, Rey, *Polygraphus poligraphus*, L., and *Crypturgus pusillus*, Gyll., together with the Cerambycid, *Tetropium castaneum*, L.

In the dense stands of spruce, fir and larch on the slopes of the mountains, spruce was infested with the following species: *Ips topographus*, L., which was the most important and was found in association with *I.* (*Pityographus*) *chalcographus*, L., *Pityophthorus pityographus*, Ratz., *I. amitinus*, Eich., and *Cryphalus abietis*, Ratz., all of which chiefly occurred on dying trees, together with *T. castaneum*, *Sirex gigas*, L., *S.* (*Paururus*) *noctilio*, F., and *S.* (*Xeris*) *spectrum*, L. Secondary pests were *Crypturgus pusillus*, *C. hispidulus*, Thoms., *I. laricis*, F., *Hylastes* (*Hylurgops*) *palliatus*, Gyll., and *Xyloterus lineatus*, Ol. Fallen trees were readily attacked by *I. typographus* on the sunny side, and on the damp and shady one by *Hylastes* (*Hylurgops*) *glabratus*, Zett., *Dryocoetes autographus*, Ratz., *D. hectographus*, Reitt., and the Lamiids, *Monochamus sutor*, L., and *M. sartor*, F., which were abundant.

The Scolytids found on spruce in the damp zone that occurred near accumulations of water were *Polygraphus poligraphus*, *P. subopacus*, Thoms., *Xylechinus pilosus*, Knoch, *Phloeophthorus spinulosus*, *Cryphalus saltuarius*, Wse., and as a secondary pest *Crypturgus cinereus*, Hbst. The weevil, *Pissodes harcyniae*, Hbst., was very abundant. Other Coleoptera found were the Lamiids, *Acanthocinus griseus*, F., and *Pogonochaerus fasciculatus*, DeG., the Melandryid, *Serropalpus barbatus*, Schall., and the Buprestids, *Chrysobothrys chrysostigma*, L., and *Anthaxia helvetica*, Stierl., both of which chiefly attacked fallen trees exposed to the sun. Fallen spruce trunks were also infested by *H. glabratus*, *D. autographus* and *D. hectographus*, and by smaller numbers of *X. pilosus* and *H. palliatus*.

In the highest zone, most of the damage was caused by *Polygraphus subopacus*, which attacked the stems of dying spruces, whereas *Cryphalus saltuarius* and *Phloeophthorus spinulosus* infested the branches. The summits of fallen trees were infested with *I. amitinus*, which was abundant, and the base by *D. hectographus*; *M. sutor* was abundant in windfalls already infested by *I. amitinus*. *Polygraphus poligraphus* and *I. typographus* were rare and confined to the lowest altitude of the zone. *Crypturgus hispidulus* was abundant as a secondary pest. The

stems of dying spruces were also attacked by the Cerambycid, *Callidium coriaceum*, Payk., which was rare.

In various parts of the forest, *Abies alba* was attacked by *Cryphalus piceae*, Ratz., and larch by *Ips cembrae*, Heer, *I. chalcographus* and *Pityophthorus pityographus*, especially in pure stands at an altitude of above 3,600 ft. *Pinus mugo* (*montana*) and *P. cembra* were infested by *I.* (*Pityogenes*) *bistridentatus*, Eich., and its variety *conjunctus*, Reitt., and *P. cembra* at altitudes of 4,900–5,250 ft. by *I. amitinus*, *Polygraphus grandiclava*, Thoms., *I. bistridentatus* and the weevil, *Pissodes pini*, L., which was abundant. Alder (*Alnus incana*) was attacked by *Dryocoetes alni*, Georg., and *Xyloterus domesticus*, L., and willow (*Salix incana*) by *Cryphalus* (*Trypophloeus*) *rybinskii*, Reitt. *Hylastes cunicularius*, Er., *H. brunneus*, Er., *H. parallelus*, Chap., *H. glabratus*, *H. palliatus*, *D. autographus* and *X. lineatus* occurred in stumps of various conifers.

If the weather in May and June is warm, the life-cycle of the first generation of *I. typographus* is completed by the end of June, and the second generation develops during July and August, the young beetles hibernating. Under favourable conditions, development occupies 60–70 days, including 12 spent by the young adults in tunnelling galleries and ovipositing. The larval stage lasts 23 days and the pupal 13, and the young beetles mature in 19. If May and June are cold, the development of the first generation is only complete in August, and the larvae or pupae of the second generation hibernate.

The bark-beetles were preyed on by numerous Coleoptera, of which the Clerid, *Thanasimus formicarius*, L., was the most important and widespread. Other species found in the galleries are enumerated. Hymenopterous parasites were scarce, but a Eurytomid and a Pteromalid were observed in an old stand, where they parasitised about 10 per cent. of the larvae of *I. typographus* in trap logs.

Recommendations are made for the selection, preparation, disposal and barking of trap logs.

Brinkmann (A.). **Betydningen av nye innvandrede faunaelementer.** [The Significance of Faunal Elements recently introduced into Norway.]—*Naturen* **58** nos. 2–3 pp. 33–46, 65–76, 4 figs., 2 refs. Bergen, February–March 1934.

This paper includes notes on *Ptinus fur*, L., which since its first appearance in the London docks in 1904 has spread throughout Europe, being first recorded in Germany in 1911. It did not become established in Norway till 1929, when it was found attacking dried fish in shops.

Bremer (H.) & Nicolaisen (A.). **Die häufigsten Krankheiten und Schädlinge der Küchenzwiebeln.** [The commonest Diseases and Pests of Onions.]—*Flugbl. biol. Reichsanst.* no. 130, 4 pp., 7 figs. Berlin, April 1934.

The injuries caused by diseases and pests to onions in Germany are shown in a key, the insects concerned being *Hylemyia antiqua*, Mg., *Acrolepia assectella*, Zell., and cutworms. A very brief account is given of their bionomics and control [*cf. R.A.E.*, A **18** 431 ; **20** 558 ; etc.].

Subklew (W.). **Ueber Schadauftreten wenig bekannter Drahtwurmarten.** (*Corymbites tessellatus* **L. und** *Ischnodes sanguinicollis* **Panz.**) [On the Occurrence as Pests of little-known Species of Wireworms.]—*Z. PflKrankh.* **44** no. 5 pp. 227–231, 1 fig., 5 refs Stuttgart, 1934.

In May 1931, young cauliflowers on a large plot in Holstein that had been under grass up to 1930 were destroyed by *Corymbites sjaelandicus*, Müll. (*tessellatus*, auct.), which was also found attacking tomatos and lettuce under glass nearby. Grass strips left unploughed in 1930 were very severely infested. Adults were common on umbelliferous plants and grasses in an adjacent meadow. After replanting, the new crop was again destroyed by the wireworms in association with *Ceuthorrhynchus quadridens*, Panz. During the ploughing, gulls assembled in numbers, and freedom from infestation in 1932 and 1933 is ascribed to them and to collection of the wireworms in the plot. In 1933, meadows adjoining the previously infested areas were ploughed, and larvae of *C. sjaelandicus* were found in abundance, together with *Athous niger*, L., and *A. obscurus*, Payk. (*haemorrhoidalis*, F.).

The larvae of *Ischnodes sanguinicollis*, Panz., not hitherto recorded as harmful to cultivated plants, were observed in 1930 boring in potato tubers in Holstein, young larvae being especially common in remains of stable manure. Much more injury to the tubers was caused, however, by *Corymbites* (*Selatosomus*) *aeneus*, L., associated with *Agriotes obscurus*, L., and *Lacon murinus*, L. In another instance, *I. sanguinicollis* and *Agriotes obscurus* did considerable damage to strawberry plants. Pieces of potato or carrot, especially the latter, proved attractive baits.

Körting (A.). **Zur Frage der Generationenfolge und der Eiablage von** *Oscinis frit* **L.** [The Sequence of Generations and Oviposition of *Oscinella frit*.]—*Z. PflKrankh.* **44** no. 5 pp. 231–247, 2 diagr., 13 refs. Stuttgart, 1934.

Records by systematic catches with a sweep-net of females ready to oviposit showed that *Oscinella* (*Oscinis*) *frit*, L., had three generations in 1931 in East Prussia. Kleine's method of sowing oats at regular intervals and examining the seedlings was also tried and gave results that disagreed with those from sweeping and are not accepted by the author [*cf. R.A.E.*, A **18** 603].

On young oat plants, most of the eggs were laid behind the coleoptiles. Of the eggs laid in unsheltered situations, about half disappeared in a few days, being removed presumably by wind and rain.

Lentz (O.) & Gassner (L.). **Schädlingsbekämpfung mit hochgiftigen Stoffen.** [Pest Control with highly poisonous Substances.] **Heft 1. Blausäure** [Hydrocyanic Acid Gas.]—72 pp., 1 pl. Berlin, R. Schoetz, 1934. Price *M.* 1·70. **Heft 2. Aethylenoxyd (T-Gas).**—52 pp., 3 figs. Price *M.* 1·20.

These booklets are guides to the use of hydrocyanic acid gas, ethylene oxide and T-gas (a mixture of the latter with carbon dioxide), as the Prussian regulations only permit these fumigants to be used by qualified persons. The characteristics of the poisons are explained, and the methods of application are shown in a series of questions and answers.

An account is given of the methods for ascertaining that the gases have been dispersed after fumigation and for first aid in case of accidents. The regulations in force in the various German States are reproduced in an appendix.

EIDMANN (H.). **Urwald und Insekten.** [Virgin Forest and Insects.]—*Natur u. Volk* **64** no. 4 pp. 121–127, 4 figs. Frankfurt a.M., 1st April 1934.

A study of insect conditions in virgin coniferous forests in Canada suggested that, although outbreaks do occur there, a return to more natural conditions would render German forests more resistant to insect damage.

VÖHRINGER (K.). **Zur Biologie der grossen Wachsmotte** (*Galleria mellonella* **Lin.). iii. Teil. Morphologische und biologische Untersuchungen am Falter der grossen Wachsmotte** (*Galleria mellonella* **Lin.).** [Morphological and Biological Investigations on the Adult of *G. mellonella*.]—*Zool. Jb.*, Anat. **58** no. 2 pp. 275–302, 9 figs., 2 pp. refs. Jena, 27th March 1934.

An account is given of the anatomy and habits of adults of *Galleria mellonella*, L., one of the most important pests of bee-hives. Oviposition does not begin until 12 hours after emergence and usually continues until death. The females lay their eggs in cracks in the wax, the number laid by individuals of a batch of 39 fertilised females varying from 468 to 1,858. Unfertilised females laid up to 681. The egg is described, with notes on its development. In batches of adults, the average life of males was longest for those that paired once (342 hours), and of females for those with fertilised eggs (193 hours). Of over 1,000 adults, 57·2 per cent. were males.

[MORDVILKO (A. K.).] **Мордвилко (А. К.). Artbildung bei Blattläusen.** [The Formation of Species in Aphids.] [*In Russian.*]—*Rev. Ent. URSS* **25** no. 1–2 pp. 7–39, 21 refs. Leningrad, 1933. (With a Summary in German.) [Recd. May 1934.]

An account is given of the gradual changes that take place in the morphology and bionomics of various Aphids owing to their migration to new food-plants and to the disappearance of the old ones, which has resulted in the formation of new species. The points discussed include mutation and selection, differentiation of forms in Aphids, evolution of biological cycles, the part played by heteroecy in the formation of species, and the existence of anholocylic forms.

[VELICHKEVICH (A. I.).] **Величкевич (А. И.). Zur Biologie der Cephiden, die in Futtergräsern leben (Hymenoptera).** [Contribution to the Biology of Cephids living in Fodder Grasses. (*In Russian.*)]—*Rev. Ent. URSS.* **25** no. 1–2 pp. 58–68, 14 figs. Leningrad, 1933. (With a Summary in German.) [Recd. May 1934.]

An account is given of observations in 1921 in the Novgorod Government and in 1922, 1925 and 1926 in the Leningrad Government on

Cephids attacking fodder grasses. In June and July, the severity of infestation varied from 1 to 79 per cent., being highest in places well exposed to the sun and sheltered from wind, and in strong healthy plants. Infested grass, the stems of which are filled with the larval frass, is injurious to cattle, and hay from it soon decays. Many of the eggs of the Cephids were parasitised by Chalcidoids and of the larvae by Braconids and Ichneumonids. *Phleum pratense* was attacked by *Cephus pilosulus*, Thoms., *Dactylis glomerata* by *Cephus* sp., and *Calamagrostis epigeios* and *Agropyrum* (*Triticum*) *repens* by *Calameuta filiformis*, Eversm. Differences in the larval structure of these three species are discussed.

The characters differentiating the adults of *C. pilosulus* and *C. pygmaeus*, L., are pointed out. In the field, the adults of *C. pilosulus* were on the wing from 20th May till 3rd July (in 1921). Pairing and oviposition take place 5–7 days after emergence ; in the insectary the adults lived 7–8 days, and in the field probably not more than 10–15. In captivity, a female oviposited in 8–15 plants, and 2–3 larvae generally occurred in each stem, one in each internode. The eggs, which are described, hatch in 9–13 days, and the larvae feed in the stems for 27–35 days, gradually descending to the base. Hibernation takes place in the base of the plant, below the surface of the soil, in a cocoon spun between two plugs of frass. Pupation occurs in the spring, usually 2 but sometimes 3 weeks before emergence. The bionomics of *Cephus* sp. are very similar, but infestation by it was slight.

The mass flight of the adults of *C. filiformis* occurred early in June, and oviposition lasted till mid-July. In the insectary, the eggs hatched in 8–15 days. After feeding for 3½–4, or sometimes 5–6 weeks, the larvae spin cocoons in the first, second or third internode from the base ; they pupate in spring, the adults emerging 2–3½ weeks later. The larvae sometimes hibernate through a second winter.

[Stark (V. N.).] **Старк (В. Н.). Beitrag zur Kenntnis der Aradusarten der europäischen Taiga (Hemiptera, Aradidae).** [Contribution to the Study of the Bugs of the Genus *Aradus* of the European Virgin Forest. (*In Russian.*)]—*Rev. Ent. URSS* **25** no. 1–2 pp. 69–82, 14 figs., 3 refs. Leningrad, 1933. (With a Summary in German.) [Recd. May 1934.]

Though most of the species of *Aradus* cannot be ranked as forest pests, their presence is a reliable index of deterioration in a stand, since they are associated with bracket fungi and trees damaged by fire. A study was therefore made in 1928–30 on their bionomics and distribution in the different types of forests in northern and north-western Russia. Special attention was devoted to *Aradus cinnamomeus*, Panz., which is itself injurious, as a primary pest, to young pines (*Pinus sylvestris* and *P. nigra*). The adults have been found on a number of other conifers and deciduous trees, which are enumerated. The distribution of this Aradid in the Russian Union is briefly discussed. It usually occurs in dry stands of trees from 5 to 20 years of age, well exposed to the sun and wind, and infests the trunks at a height of about 4½–6½ ft., especially on the outskirts of a stand. There is one generation a year, but in the Kola Peninsula the life-cycle probably covers two years or more. The adults hibernate on pine trunks and begin to feed in April. In the Leningrad Government, oviposition occurred at the end of April, first-instar nymphs were found from mid-May till 10th

June, and the first adults on 17th July ; most of the adults appeared in August. The bugs are very sluggish, and often the whole life-cycle from egg to adult is completed under the same scale of the bark. They feed on the sap of the bast, and, if numerous, weaken the trees and render them susceptible to other pests, of which the most important in northern Russia is the weevil, *Pissodes piniphilus*, Hbst. Even in the absence of secondary pests, prolonged infestation may cause the death of the tree, and trees that recover do not reach normal height.

Other species of *Aradus* found were *A. lugubris*, Fall., *A. somcheticus*, Kirichenko, *A. depressus*, F., *A. brevicollis*, Fall., *A. betulinus*, Fall., *A. corticalis*, L., *A. signaticornis*, R. F. Sahlb., *A. aterrimus* var. *moestus*, Reut., *A. angularis*, J. Sahlb., *A. betulae*, L., *A. erosus*, Fall., *A. crenaticollis*, R. F. Sahlb., and *A. pictus*, Baer. Brief notes are given on the bionomics of each species except the last two, and a table is appended showing their abundance on various trees and in the different types of forest.

[Bukovskiĭ (V.).] **Буковский (В.). Oekologische Rassen bei Braconiden (Hymenoptera) in Abhängigkeit von verschiedenen Wirten.** [Ecological Races of Braconids due to Parasitism of different Hosts. (*In Russian.*)]—*Rev. Ent. URSS* **25** no. 1–2 pp. 83–88, 7 refs. Leningrad, 1933. (With a Summary in German.) [Recd. May 1934.]

In a study of the parasites of the oak weevil, *Rhynchaenus* (*Orchestes*) *quercus*, L., and the beech weevil, *R.* (*O.*) *fagi*, L., in the Crimea, it was found that adults of *Triaspis* (*Sigalphus*) *fagi*, Ratz., and *Calyptus minutus*, Ratz., reared from larvae of the larger species (*R. quercus*), were considerably larger and had a greater number of antennal segments than those from the smaller (*R. fagi*). The two Braconid species are described, and variations in the characters of the beech and oak races of each are shown in tables. The author considers that *T. fagi* is distinct from *T.* (*S.*) *pallidipes*, Nees, and that records of the latter as a parasite of these weevils [*R.A.E.*, A **8** 331 (? *cf.* also **17** 122)] should be referred to the former.

[Nikol'skaya (M. N.).] **Никольская (М. Н.). A new Species of Seed-infesting Chalcid-Fly, *Eurytoma onobrychidis*, sp. n. (Chalcididae) on *Onobrychis sativa*, and its Parasites.** [*In Russian.*]—*Rev. Ent. URSS* **25** no. 1–2 pp. 119–133, 17 figs., 20 refs. Leningrad, 1933. (With a Summary in English.) [Recd. May 1934.]

Descriptions are given of the full-grown larva (in Russian) and of the adults of both sexes (in Russian and Latin) of *Eurytoma onobrychidis*, sp. n., bred from the seeds of sainfoin (*Onobrychis sativa*) in Poltava (Ukraine) in 1927–28. Infestation was slight, and about 98 per cent. of the larvae were destroyed by parasites. The eggs are probably laid in the young pods, and the larvae gradually eat out the seeds from the surface. Some reach the adult stage in autumn, but others hibernate. The ten species of parasites reared were the same as those already recorded from the Eurytomid, *Bruchophagus gibbus*, Boh., in lucerne seeds in this locality [*R.A.E.*, A **21** 578]. The author believes *Tetrastichus venustus*, Gah., to be a synonym of *T. brevicornis*, Nees.

[Yakhontov (V. V.).] **Яхонтов (В. В.).** ***Anaphothrips flavicinctus* Karny, espèce nouvelle pour la région paléarctique, comme ennemi de l'*Andropogon sorghum contractus* Kche. à Bokhara (Thysanoptera).** [*In Russian.*]—*Rev. Ent. URSS* **25** no. 1–2 pp. 174–176. Leningrad, 1933. [Recd. May 1934.]

A description is given of the female of *Anaphothrips flavicinctus*, Karny, which occurred in very large numbers in the leaf-sheaths of *Sorghum* near Old Bokhara (Uzbekistan), causing the infested leaves to crinkle. No males were found. The thrips were often preyed on by *Aeolothrips fasciatus*, L., and the Anthocorid, *Orius* (*Triphleps*) *albidipennis*, Reut. *A. flavicinctus* has previously been recorded only from Java, Ceylon and Australia.

[Pyatnitzkiĭ (G. K.).] **Пятницкий (Г. К.). The Meadow Moth and Weather.** [*In Russian.*]—*Klimat i Pogoda* [*Climate & Weather*] **10** no. 1 pp. 8–13, 5 charts, 1 ref. Leningrad, Izd. glavn. geofiz. Obs. [Pub. chief geophys. Obs.], 1934.

This paper, which is the first of a projected series on the relation to weather conditions of the chief agricultural pests in the Russian Union, presents the results of investigations on *Loxostege sticticalis*, L. It is concluded that adult emergence begins in the first ten-day period in spring in which the mean temperature is not lower than 17°C. [62·6°F.], and reaches a maximum in the next such period. A fall in temperature or a dry spell after flight has begun prolongs the flight period, and the whole life-cycle extends to 50 days, as compared with the normal 40 days, or 30 at a mean temperature of 25°C. [77°F.]. Lack of rain (less than 10 mm.) at the time of pupation, or a fall of temperature below 17°C., correspondingly increases the number of larvae that enter the diapause, reactivation beginning only at a rise in temperature up to 17°C., or if considerable rainfall occurs. As a result, intermediate generations appear, development is retarded, and, though less injury is caused, reserves of the species are accumulated for the following year.

If, during the flight period, the mean ten-day temperatures and rainfall are below 15°C. [59°F.] and 7·5 mm., respectively, the moths remain sterile [*cf.* **21** 161]. The species thus normally inhabits regions in which the mean ten-day temperatures and rainfall for at least one month in spring are not lower than 17°C. and 8·5 mm. An analysis of the weather conditions accompanying several sudden outbreaks in central Russia that were supposed to be due to migration from south-eastern Russia [*cf. R.A.E.*, A **20** 262, etc.] indicated that they were of purely local origin. It was found that migrations take place only where the contact of advancing masses of arctic air with continental or tropical ones causes small local depressions ; under the direct effect of these, the moths rise into the air, but do not fly beyond their normal range. Unexpected outbreaks [*cf.* **19** 76] will occur in the year following one in which the mean temperature (particularly in June) is considerably below normal. This cold weather results in a prolonged flight of the first and subsequent generations. If, in addition, there is a copious rainfall, the fertility of the moths is increased [*cf.* **21** 161], and an unrestrained growth of weeds ensures an abundant supply of food for the larvae [*cf.* **21** 621]. Frequent short spells of cold weather cause local rainfall and the concentration of the moths in places where rain has fallen. This accumulation of reserves occurs gradually and passes unnoticed till the outbreak occurs in the next year.

Smirnov (E.) & Polejaeff (W.). **Density of Population and Sterility of the Females in the Coccid** *Lepidosaphes ulmi* **L.**—*J. Anim. Ecol.* **3** no. 1 pp. 29–40, 6 figs., 8 refs. London, May 1934.

Observations during the winter 1931–32 on *Lepidosaphes ulmi*, L., on ash twigs taken from parks and streets in Moscow led to the conclusion that the decrease in fecundity that accompanied an increase in infestation [*R.A.E.*, A **22** 144] was due simply to the presence of sterile scales. There was no definite negative correlation between the average fecundity of fertile females and the density of infestation, but the latter was directly correlated with the percentage of sterile females of both large and small forms [*loc. cit.*]. This suggests that some factor other than the direct action of scarcity of space and food is operative.

Takei (S.), Miyajima (S.) & Ōno (M.). **Ueber Rotenon, den wirksamen Bestandteil der Derriswurzel, xiv–xvi. Mitteilung.** [On Rotenone, the active Constituent of Derris Root, Communications xiv–xvi.]—*Mem. Coll. Agric. Kyoto Univ.* no. 31 (chem. Ser. no. 17) 24 pp., 17 refs. Kyoto, March 1934.

In these continued chemical investigations on rotenone [*cf. R.A.E.*, A **20** 728], reactions have been discovered that permit of the quantitative analysis of the physiologically active components of derris roots.

Shibata (B.). **Ecological Studies of Plant Lice. III. Experimental Production of amphigonous Females and Males.** [*In Japanese.*] —*Bull. Utsunomiya agric. Coll.* no. 5 pp. 177–207, 32 refs. Utsunomiya, Japan, March 1934. (With a Summary in English.)

Details are given of experiments in which sexual forms of *Callipterus kuricola*, Mats., were produced by continuous or intermittent exposure to certain low temperatures.

Katsumata (K.). **Results of Breeding Experiments with** *Chilo simplex*, **Butl., especially on the Duration of the Larval Instars and the Thermal Constant. 1 & 2.** [*In Japanese.*]—*J. Plant. Prot.* **21** nos. 2–3 pp. 35–48, 187–198. Tokyo, February–March 1934.

In the first generation of the rice-borer, *Chilo simplex*, Butl., there are 5–7 larval instars, usually 6 ; in the second, there are usually 6 or 7 but sometimes 8 or 9, the winter being passed in the fifth or a later instar. There are two broods a year in central Honshu, but a third was sometimes reared indoors. In the first generation, the egg, larval and pupal stages average 8·2, 39 and 8·2 days respectively, and in the second, 6, 277 and 22·4.

Fukushi (T.). **On the Relation between a Virus of the Rice Plant and** *Nephotettix bipunctatus cincticeps*, **Uhl. 1–3.** [*In Japanese.*]—*Agric. & Hort.* **9** nos. 3–5, pp. 669–676, 879–890, 1091–1094, 2 figs. Tokyo, March–May 1934.

The fact that a serious virus disease of rice in Japan is transmitted by a leafhopper was discovered some 40 years ago by H. Hashimoto, and in 1900 *Nephotettix bipunctatus cincticeps*, Uhl., was considered to be the vector in Shiga Prefecture [*R.A.E.*, A **20** 275]. Brief notes are given on the insect and its life-history.

In experiments in transmission by this Jassid, some individuals became infective after feeding for only 5 minutes on an infected plant.

Many individuals bred on unhealthy plants and transferred to new healthy ones every day transmitted the disease for from 10 days to over a month. The offspring of infected leafhoppers retained the virus throughout life [*cf.* **22** 59], but did not cause the disease within 3–14 days after hatching. The virus seems to pass the winter in the body of this insect. Certain individuals of this species were, however, unable to transmit the disease [*cf.* **21** 486, etc.].

ESAKI (T.) & HASHIMOTO (S.). **Report on the Leafhoppers injurious to the Rice Plant and their Natural Enemies, No. 5 (for the Year 1933).** [*In Japanese.*]—*Publ. ent. Lab. Dep. Agric. Kyushu Univ.* 40 pp., 3 figs., 3 pls. Fukuoka, March 1934.

The numbers of *Nephotettix bipunctatus cincticeps*, Uhl., *Deltocephalus dorsalis*, Motsch., *Delphacodes striatella*, Fall., *Sogata furcifera*, Horv., and *Nilaparvata oryzae*, Mats., collected by a light-trap from May to September 1933 at Oitu, Kyushu, are shown in graphs. More were taken on cloudy than on fine nights. All the nymphal instars and the adults of the first two are described. The Sphegid, *Stizus japonicus*, Yasumatsu, sp. n., preys on the Jassids, *Eutettix discigutta*, Wlk., and *Macropsis diminuta*, Mats., and the Psyllid, *Anomoneura mori*, Schwartz. A Dryinid was found in 2 nymphs of *Tambinia debilis*, Stål. Males of the Stylopid, *Tettigoxenos orientalis*, Esaki & Hshm., were found parasitising 2 males and 27 females of *N. b. cincticeps* [*cf. R.A.E.*, A **20** 380], and a description is given of the larva of *Pipunculus* sp., which parasitised 46 per cent. of this Jassid, causing the males to assume female coloration.

In experiments in the transmission of a virus disease of rice by *N. b. cincticeps*, some healthy plants apparently became infected by the feeding of leafhoppers from diseased ones [see preceding abstract].

KUWAYAMA (S.). **Notes on the Couch-grass Moth,** *Parastichtis basilinea basistriga* **Staud.** [*In Japanese.*]—*Kontyu* **8** no. 1 pp. 23–36, 1 pl., 1 fig. Tokyo, March 1934.

All stages are described of *Trachea* (*Parastichtis*) *basilinea basistriga*, Staud., which was recognised in 1932 as an important pest of wheat in Hokkaido and is also found in Sakhalin. This Noctuid appears to occur in dry, high lands, attacking the ears of wheat, oats, rye and maize, and also feeding on other graminaceous plants. There is one brood annually. The full-grown larvae overwinter, pupating in the soil in spring, and the moths emerge in June and July. The larvae are negatively phototropic and are only active at night. After the crops are harvested, they continue to feed in the storehouses, and cannibalism is observed even when food is not scarce. The Carabid, *Calosoma maderae* var. *chinense*, Kby., attacked the larvae. Autumn ploughing, threshing soon after harvest, and fumigation with carbon bisulphide or chloropicrin are recommended for control.

Trachea (*Parastichtis*) *secalis*, L., also attacks wheat in Hokkaido.

SASAKI (C.). **On the Larva of** *Chrysochroa fulgidissima*. [*In Japanese.*] —*Insect World* **38** no. 3 pp. 80–82, 1 fig. Gifu, March 1934.

A brief description is given of the larva of the Buprestid, *Chrysochroa fulgidissima*, Schönh., found boring in the trunk of *Quercus acuta* in Japan.

KOITAHASHI (S.). **Observations on** *Smerinthus planus*, **Wlk., a Pest of Willow.** [*In Japanese.*]—*Ent. World* **2** no. 8 pp. 169–177. Tokyo, April 1934.

All stages are described of the Sphingid, *Smerinthus planus*, Wlk., which has been known as an important pest of willow in Japan since 1908, and also attacks apple, cherry and poplar. Hibernation takes place in the pupal stage underground, and there are two generations a year, the moths emerging from late April to mid-May and again in August. The eggs, which are laid singly on the leaves, hatch in 6 days, and the 6 larval instars are completed in about a month. In summer, the pupal period lasts about 3 weeks.

WATANABE (C.). **Notes on Braconidae of Japan IV.** *Apanteles* **(First Supplement).**—*Insecta matsum.* **8** no. 3 pp. 132–143, 1 fig. Sapporo, March 1934.

The Braconid parasite of *Euproctis pseudoconspersa*, Strand, in Formosa, considered by Sonan [*R.A.E.*, A **16** 482] and the author to be *Apanteles lacteicolor*, Vier., is now identified as *A. conspersae*, Fiske. Characters distinguishing it are given. It has also been reared from *E. pseudoconspersa* and *E. flava*, Brem., in Japan. *A. igae*, Watan. [**21** 211] is a synonym of *A. carpatus*, Say. *A. liparidis*, Bch. (*japonicus*, Ashm.) was reared by the author from *Dasychira pseudabietis*, Butl.; it is also recorded from *Notolophus* (*Orgyia*) *posticus*, Wlk., *Malacosoma neustria*, L., and other hosts [**18** 33; **20** 653] in Japan. The 9 new species described from Japan include *A. amphipyrae* from *Amphipyra pyramidea*, L., *A. conopiae* from *Aegeria* (*Conopia*) *hector*, Butl., and *A. uchidai* from *Enarmonia* (*Epinotia*) *diniana*, Gn.

KAYASHIMA (I.). **On the Damage caused by Leafhoppers to useful Trees in Formosa.** [*In Japanese.*]—*Taiwan no Sanrin* no. 94 pp. 31–34. Taihoku, Formosa, February 1934.

Brief notes are given on some Jassids injurious to various cultivated trees in Formosa, including *Nirvana orientalis*, Mats., on seedlings of *Acacia confusa*, *Erythroneura* (*Typhlocyba*) *bipunctula*, Melich., and *E.* (*T.*) *subrufa*, Motsch., on *Bischofia javanica*, *Idiocerus clypealis*, Léth., and *I. niveosparsus*, Léth., on mango, and *Empoasca* (*Chlorita*) *flavescens*, F., and *Balclutha smaragdula*, Mats., on peach and plum.

KING (C. B. R.). **An Experiment with** *Trichogramma* **and Tortrix.**—*Tea Quart.* **7** pt. 1 pp. 15–18, 1 fig. Talawakelle, Ceylon, February 1934.

At the beginning of January 1934, egg-masses of the tea tortrix [*Homona coffearia*, Nietn.] newly parasitised by *Trichogramma* [*cf. R.A.E.*, A **21** 404] were stuck on labels and attached to iron rods, which held them a few inches above tea bushes, in ten experimental plots. From 1,000 to 4,000 parasites were liberated in each plot, but examination later in the same month and in February showed that only five egg-masses (in three of the ten plots) were parasitised by the parasites liberated in them. In two of these plots they failed to reproduce further, and in the third their numbers decreased. The maximum parasitism was 20 per cent. of the eggs in a mass. The

poor results obtained may be partly due to the occurrence of heavy rain on one afternoon. Observations at other times have shown that *Trichogramma* is capable of becoming quickly established in the field and of parasitising about 60 per cent. of the eggs in about half the egg-masses. It thus appears that there is considerable uncertainty attending its utilisation [*cf.* **22** 167].

King (C. B. R.). **Cold Storage Effect on *Trichogramma* and on the Eggs of *Ephestia kühniella*.**—*Tea Quart.* **7** pt. 1 pp. 19–27. Talawakelle, Ceylon, February 1934.

The results are given of experiments carried out in Ceylon on the effect of cold storage (at a temperature fluctuating between 38 and 45°F.) on *Trichogramma evanescens*, Westw., reared in eggs of *Ephestia kühniella*, Zell., for liberation [against *Homona coffearia*, Nietn., on tea]. Rearing of over a million parasites showed that more than 98 per cent. emerge from parasitised eggs under normal conditions. When parasitised eggs were kept at 70°F. until the day before emergence was due and then placed in cold storage, the percentage emerging was over 90 from eggs stored for up to three weeks, after which it decreased. The reduction occurred rather sooner when the eggs had previously been kept at 84°F. The development and fertility of the offspring of parasites subjected to cold storage was normal. In another experiment, normal emergence occurred after 14 days' cold storage from batches of eggs placed in cold storage daily after the darkening in colour that occurs less than half-way through the development of the parasite. Development occupied the usual 15 days apart from the time in cold storage.

Experiments were also undertaken on the effect of temperatures of 32–38°F. on the eggs of *Ephestia*, in view of the fact that the larvae web together and feed on those that are parasitised or unhatched. About 80 per cent. of the eggs survived cold storage for a week. Only 1·6 hatched after six weeks, the larvae being markedly less active than those from untreated eggs, but the eggs were still as attractive to *Trichogramma*, the development of which in them was normal [*cf. R.A.E.*, A **22** 315].

Commun (R. L.). **Moyens de protection contre les insectes du paddy entreposé.**—*Bull. écon. Indochine* **37** pp. 125–129. Hanoi, 1934.

The chief pests of stored rice in Indo-China are *Calandra oryzae*, L., and *Sitotroga cerealella*, Ol. Large quantities of rice are best protected by storage in magazines of metal or reinforced concrete. In large granaries in which fumigation is possible, a fumigant such as carbon tetrachloride may be used to free the crop from infestation. The windows and doors should be shut and small openings filled with bags of earth, which are then moistened; jars containing 13 oz. carbon tetrachloride should be placed (at intervals of about 2 yds.) 18 ins. deep in the layer of grain, which should be 2 ft. thick; this should be covered and left for 48 hours. Before introducing the new crop, the beams of the granary should be treated with 50 per cent. coal tar and the walls whitewashed (about 1 lb. lime to 1 gal. water). Sulphur (at the rate of 30 oz. with the addition of 2 oz. saltpetre per 1,000 cu. ft.) may be burnt in the centre of empty spaces in a receptacle placed within a larger one containing water or sand.

More frequently, however, smaller quantities of rice are stored in open sheds, either in upright rolls of matting or in wooden boxes that are not insect-proof. If it is periodically winnowed during the dry season, and the husks and infested grains, which are thrown to the end of the machine, are immediately burnt, most of the weevils and many of the caterpillars will be destroyed. Many insects shelter in the matting, which, before being used for the following crop, should be spread out in the sun and treated on both surfaces with boiling water, or immersed in water for several days and then dried in the sun. The matting and the sheds and boxes should be treated annually with coal tar.

VAN DER VECHT (J.). **Het poetjoek-rupsje van de peper** (*Laspeyresia hemidoxa* **Meyr.**). [The Pepper Shoot-Caterpillar, *Cydia hemidoxa*.] —*Landbouw* **8** no. 10 reprint 7 pp., 4 figs. Buitenzorg, April 1933. (With a Summary in English.) [Recd. May 1934.]

Cydia (*Laspeyresia*) *hemidoxa*, Meyr., attacks pepper [*Piper*] in Banka [*R.A.E.*, A **19** 516] and at Buitenzorg (Java) and probably occurs in Borneo. The larva, pupa and adult are briefly described. In Banka, the larvae have been found exclusively on young pepper vines, sometimes 3 or 4 on a branch. By day they usually remain hidden in a loose web. They eat holes in the leaves and leaf-stems and climbing shoots, sometimes causing the tips to die. The larval stage probably does not last more than 2 weeks. Pupation occurs on or just below the surface of the soil. The adults emerge 10–12 days after the larvae begin making their cocoons, the pupal stage lasting 8–10 days. The damage caused is not severe, but a heavy infestation may check growth. As arsenical sprays scorch the pepper vines, hand-picking is advised.

MCKEOWN (K. C.). **The Food of Birds from south-western New South Wales.**—*Rec. Aust. Mus.* **19** no. 2 pp. 113–135, 22 refs. Sydney, 26th March 1934.

This paper includes lists of 118 birds of 62 species occurring in south-western New South Wales (arranged according to their diets, which consist largely of insects), and of their stomach contents. A separate list records the insects and other animals of economic importance eaten.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **45** pt. 4 pp. 210–215, 7 figs. Sydney, 1st April 1934.

These notes include a brief account of *Chortoicetes terminifera*, Wlk., the commonest grasshopper in central and western New South Wales [*cf. R.A.E.*, A **13** 640; etc.]. Hoppers hatch from overwintered eggs in September-November and develop in about 6 weeks. Eggs laid by this generation hatch in 18–21 days, producing a second brood of winged adults in February–April. There is possibly a third brood in some years. The adults live several weeks, so that hopper and winged swarms may overlap. Late winged swarms in May–June may attack seedling wheat. Recommendations are made for control by means of baits and sprays [*cf.* **14** 204].

Considerable damage has recently been caused to tomatos by *Phyllocoptes lycopersici*, Tryon (tomato mite), which first causes

silvering and curling of the lower leaves; the stem and leaf-stalks then turn brown, the lower leaves and the flowers drop and the fruits become stunted and rough-skinned. In the field, summer and autumn tomatos should be sprayed, soon after the first bunch of fruit sets and again within 1–2 weeks of the first picking, with lime-sulphur (1 : 80) or atomic sulphur (1 lb. in 12 gals. water). In the greenhouse, sulphur dust should be applied every 3 weeks after blossoming.

Removal of Arsenical Residue from Apples. Tests with Sodium Carbonate.—*Fruit World Aust.* **35** no. 4 p. 188. Melbourne, 1st April 1934.

In view of the difficulty experienced in New South Wales in removing residues of lead arsenate and oil from apples with hydrochloric acid, tests were carried out on the efficiency of sodium carbonate, which has replaced the acid wash under certain conditions in the United States [*cf. R.A.E.*, A **21** 319]. The fruit was immersed for 1½ mins. in solutions at 108°F. On apples treated with 1 calyx and 5 cover sprays of 3 lb. lead arsenate and 1 lb. calcium caseinate to 100 gals., a 1½ per cent. solution of hydrochloric acid removed 90 per cent. of the residue, leaving an average of 0·0072 grain As_2O_3 per lb. fruit, whereas solutions of 8 and 12 lb. sodium carbonate in 8 gals. water removed 88 per cent., leaving residues of 0·0089 and 0·0091 gr. When 1 per cent. summer oil was included in the cover sprays, the acid wash removed only an average of 78 per cent. of the residue, leaving a mean of 0·0163 gr., and the sodium carbonate left as much as 0·0254 and 0·0202 gr., these quantities being well in excess of the world trade tolerance of 0·01 gr. per lb.

Thung (T. H.). **Bestrijding der krul- en kroepoek-ziekten van tabak.** [The Control of Curl and Crinkle Diseases of Tobacco.]—*Meded. Proefst. vorstenl. Tabak* no. 78, 18 pp., 4 charts. Klaten (Java), 1934. (With a Summary in English.)

Further studies of leaf-curl and leaf-crinkle of tobacco in the Vorstenland districts of Java, where these virus diseases are transmitted by an Aleurodid, very probably of the genus *Bemisia* [*R.A.E.*, A **20** 381], have shown that round Klaten the sources of infection are practically confined to the weeds, *Ageratum conyzoides*, *Synedrella nodiflora* and *Vernonia cinerea*, which act as reservoirs between the tobacco seasons. In 1933, the diseases were successfully controlled by completely clearing these weeds for a distance of about 50 yards from the plantations three times (in mid-June, mid-July and mid-August).

Green (H.). **Report of the Botanical and Forestry Department (Hong Kong) for the Year 1933.**—Med. 8vo, 9 pp. Hong Kong, 1934.

The Lasiocampid, *Dendrolimus punctatus*, Wlk., appeared in pine plantations in Hong Kong during January. Beginning in February, 480 lb. of larvae were collected and buried, this being the only effective method of saving the trees. A consignment was obtained from Hawaii of the lantana seed fly [*Ophiomyia* (*Agromyza*) *lantanae*, Frogg.], which destroys the unripe seeds of *Lantana*, and the lantana plume

moth [*Platyptilia pusillidactyla*, Wlk. (*lantana*, Busck)], which attacks the unopened flower-buds. Liberations were made in suitable spots on 21st July, but no evidence of establishment has been obtained.

Beeson (C. F. C.). **Prickly Pear and Cochineal Insects.**—*Indian For.* **60** no. 3 pp. 203–205, 5 refs. Lahore, March 1934.

At various dates from 1795 to 1836, *Dactylopius ceylonicus*, Green (*indicus*, Green) was introduced into India [*cf. R.A.E.*, A **19** 535], apparently in mistake for the true cochineal insect, *D. coccus*, Costa (*cacti*, auct.). It proved inferior to *D. coccus* in the production of cochineal, and the industry died out. *D. ceylonicus*, however, spread rapidly on *Opuntia monacantha* throughout India, and by the middle of the nineteenth century it had practically eradicated it from northern and central India. About this time, it was taken from Madras to Ceylon, where it rapidly brought the cactus under control [**15** 100]. It has also spread to the sub-Himalayan tract of the Punjab, where it periodically destroys the cactus. Attempts in the late nineteenth century to use *D. ceylonicus* to control *Opuntia* in South India failed, because the commonest species there were *O. dillenii* and *O. nigricans*, on which *D. ceylonicus* does not feed. In 1913, it was sent to Queensland against *O. monacantha* [**3** 126]. In 1924, consignments of the American species, *D. opuntiae*, Ckll. (*tomentosus*, auct.) were received from Australia and liberated against *O. dillenii*, which was a pest in the north of Ceylon, and in 4 or 5 years it had completely destroyed it [**21** 262; etc.]. From Ceylon it was unofficially introduced into South India in 1926, whence it has spread rapidly to adjacent districts, occurring throughout an area of over 40,000 sq. miles by 1930.

For control, heavily infested pieces of the species of *Opuntia* concerned should be placed in the cactus clumps, preferably on the shady side and in the absence of rain and wind. The young larvae spread on to the healthy cacti, and within 7–10 days begin to cover themselves with a white cottony secretion. Gradually the whole plant becomes covered with a close mass of this secretion, and eventually small tubular cases are formed from which the winged males emerge. The life-cycle of the female lasts about 45–50 days. *Dactylopius* feeds throughout the year and is free-living for only a short period during the early stages, so that a continuous food-supply is necessary. It is incapable of living on plants other than *Opuntia*.

Ramakrishna Ayyar (T. V.) & Margabandhu (V.). **Further Records of Indo-Ceylonese Chalcid Flies.**—*J. Bombay nat. Hist. Soc.* **37** no. 1 pp. 192–196. Bombay, 15th April 1934.

This list supplements previous ones [*R.A.E.*, A **13** 645; **16** 48] of the Chalcidoids of India and Ceylon.

Bodenheimer (F. S.) & Ashbel (R.). **Preliminary Note on the Effect of manuring Citrus Trees in Regard to the Development of Red Scale** (*Chrysomphalus aurantii*).—*Hadar* **6** no. 8 pp. 175–178, 2 figs. Tel-Aviv, August 1933.

Two years' work in Palestine with *Citrus* seedlings growing in soil or water containing various combinations of nutritive salts suggests that fertilisers are of no value in the control of *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask.

Husband (A. D.) & Duguid (J. F.). **The Toxicity to grazing Animals of Grass sprayed with Sodium Arsenite.**—*Rhod. agric. J.* **31** pp. 25–39. 10 refs.; also as *Bull. Minist. Agric.* [*S. Rhod.*] no. 910, 15 pp. Salisbury, S. Rhodesia, January 1934. [Recd. May 1934.]

In experiments in Southern Rhodesia in view of the possible danger to cattle from sodium arsenite sprays applied against locust hoppers, it was found that the minimum lethal dose was about 30 grains As_2O_3. On a plot of tall, dense grass, a rate of about 8 lb. sodium arsenite (in about 150 gals.) per acre was the least that would give an efficient light spray coverage at the recommended strength [*cf. R.A.E.*, A **21** 672], though the rate recommended by the Entomological Branch is actually 2–2½ lb. Analysis of grass from this plot showed that a lethal dose was contained in about 3·7 lb. of the fresh grass or 1·7 lb. of the ash after burning, the percentage contents of As_2O_3 being 0·12 and 0·26 respectively. On a plot sprayed at the rate of 2⅝ lb. per acre, the percentage content decreased from 0·052 to 0·025 in the course of 8 weeks during which no rain fell. An ox grazing in a paddock very lightly sprayed (1½ lb. per acre) died in 100 hours. Analyses of the organs of poisoned cattle showed that the omasum and kidney give more reliable indications as to whether arsenic has been ingested than the abomasum.

These experiments show that sprayed grass is a serious source of danger to cattle, and it should therefore be either fenced off or burnt.

Masera (E.). **Un fungo del genere *Botrytis* parassita degli insetti.**—*Riv. Biol.* **16** no. 2 pp. 266–272, 5 figs., 4 refs. Florence, 1934.

A species of *Botrytis* differing from those known to him was obtained by the author in Italy from dead larvae of *Bombyx mori*, L. The fungus killed larvae of *Tenebrio molitor*, L., when ingested by them. Experiments are being carried out in infesting *Thaumatopoea* (*Cnethocampa*) *pityocampa*, Schiff., with it.

Ripper (W.). *Chaetocnema aridula* **Gyllh.**—*Neuheiten PflSch.* **27** no. 2 pp. 27–29. Vienna, May 1934.

Serious injury by *Chaetocnema aridula*, Gyll., to wheat in Austria in 1933 [*cf. R.A.E.*, A **22** 229] was confined to fields sown before 1st October 1932, to which the beetles had migrated before hibernating. In 1933, many fields were sown after 1st October, so that the only source of infestation might be the spring immigration of such beetles as had escaped winter measures. The natural winter mortality averaged about 19 per cent., being heaviest among the males.

The 3 per cent. tar distillate emulsion [**22** 230] contains an amount of soft soap proportionate to the hardness of the water. A spray of 3 (or sometimes 1½) pints per sq. yd. of ground surface killed all the hibernating beetles. If a watering can is used instead of a power sprayer, 4½ pints are required. This treatment has been successful at temperatures as low as 6·5 to −8°C. [43·7–17·6°F.].

Leitsätze zur Durchführung der Bekämpfungsmassnahmen gegen die San José-Schildlaus. [Rules for the Execution of Measures against the San José Scale.]—*Landwirtschaft* 1933 no. 5 pp. 134–136. (Abstr. in *Neuheiten PflSch.* **27** no. 2 pp. 39–40. Vienna, May 1934.)

To ensure uniformity in work in Austria against *Aspidiotus perniciosus*, Comst., on fruit trees, etc., the agricultural corporations

laid down in February 1933 a series of rules grouping plants according to susceptibility to attack and specifying drastic measures directed to checking the spread of the pest and to combating existing infestations.

KLEIN (K.). **Die Birnblattpockenmilbe als Baumschulschädling.** [*Eriophyes pyri* as a Pest in Tree Nurseries.]—*Ratschläge f. Haus-Garten-Feld* (B) **8** pp. 53–54, 1 fig., 1933. (Abstr. in *Neuheiten PflSch.* **27** no. 2, p. 40. Vienna, May 1934.)

All grafted pears in a nursery in Carinthia were so severely infested by *Eriophyes pyri*, Pgst., as to require treatment with a sulphur spray, which proved successful.

SCHEIBE (—). **Achtet auf die Apfelblattmotte!** [Pay Attention to the Apple Leaf Skeletoniser.]—*Kranke Pflanze* **11** no. 4–5 pp. 51–52. Dresden, 1934.

In the summer of 1932, *Hemerophila* (*Simaëthis*) *pariana*, Clerck, defoliated apple trees in Saxony, where such an outbreak had not occurred before. The injury in many orchards resulted in the destruction of the crop. There are two generations a year; the larvae appear in June and August, and the second-generation adults hibernate. An arsenical spray or dust should be applied in June, but in August, when arsenicals are only safe on late varieties of apple, a spray containing 2 per cent. barium chloride and 2 per cent. sugar or molasses (as an adhesive) should be used. The larvae can be made to drop by shaking the trees. Many of the pupae occur on the trunks and branches, where they can be killed by painting with a tar distillate.

PFEFFER (A.). **Invasion de *Panolis flammea* en Slovaquie occidentale. Biologie. Moyens repressifs etc.** [*In Czech.*]—*Rec. Trav. Inst. Rech. agron. Tchécosl.* **116** no. 2 pp. 3–54, 11 figs., 2 pls., 28 refs. Prague, 1933. (With Summaries in French and German.) [Recd. May 1934.]

A severe outbreak of *Panolis flammea*, Schiff., over a large forest area in the valley of the Morava in western Slovakia that began in 1930 and reached its maximum in 1932 was due to dry, warm weather in the spring of those years [*cf. R.A.E.*, A **17** 494; etc.]. The chief infestation occurred on pines 30–60 years old [*cf.* **19** 126] in stands growing on high ground under less favourable conditions. Older trees were attacked towards the end of the outbreak, but trees less than 20 years old usually escaped infestation. At the peak of the outbreak, the larvae also attacked silver fir [*Abies*], spruce and some deciduous trees [*cf.* **17** 680]. The area infested was about 10,500 acres in 1931 and over 14,800 in 1932.

An account is given of the biology of the moth, and all stages are described. The adults emerge from overwintered pupae from mid-April to the end of May, large numbers appearing at the beginning of May, especially after warm rain or before a thunder-storm. A few moths emerge in the preceding August and September, but die without progeny. Flight and pairing chiefly take place after sunset. A female contains 550–600 eggs, of which, however, only about 120–130 are deposited [**21** 529; but *cf.* **16** 178]. They are laid in rows on the needles of the preceding year's pine shoots, chiefly in the central

part of the crown. The optimum conditions for the development of the eggs occur at temperatures between 12 and 22°C. [53·6–71·6°F.] and a relative humidity of 65–85 per cent. [**19** 613]. They are killed by temperatures below 6°C. [42·8°F.] or above 29°C. [84·2°F.], as well as by humidity above 90 per cent., but are able to resist dry conditions. The egg stage lasts from 7 days at 25°C. [77°F.] to 47 at 8°C. [46·4°F.], with an average of 10 days at 19°C. [66·2°F.]. The young larvae are killed by temperatures below 6°C. or relative humidity below 40 per cent. They feed on the tips of the very young needles or hollow out the buds. At relative humidities of 80–90 per cent., they can withstand starvation for 5–8 days, but under dry conditions for not more than 2 or 3. In a stand 30–50 years old, 400–600 larvae can completely defoliate an average tree. Allowing for a natural mortality of about 20 per cent. of the eggs and young larvae, the presence of 300 eggs on an inferior tree, or of 1,000–1,300 on a well developed one, is a reliable index of impending defoliation. The mean duration of the larval stage is about 35 days, of which 18–20 are spent in voracious feeding and 3–5 days in prepupal rest. If the weather in May is cold, about 90 per cent. of the larvae die in the first instar, whereas in later ones not more than 10 per cent. succumb to unfavourable conditions. Where the ground is covered with moss, most of the pupae occur immediately under it ; where it is only covered with pine needles, they are found at a considerable depth in the soil. It is estimated that the presence of 1 healthy pupa to 2 sq. ft. normally suffices to ensure defoliation by the subsequent generation [*cf.* **19** 724]. Within two years, new foci of infestation due to adult flight were found at distances of 6 and 12 miles from the initial focus.

Ernestia rudis, Fall., parasitised about 63 per cent. of the larvae in 1932. The adults of this Tachinid, which are briefly described, emerge at the beginning of May [*cf.* **21** 529], the males preceding the females by 10–12 days. The flies congregate in large numbers on the flowers of *Euphorbia cyparissias* and *Potentilla arenaria*, as well as on the sunny side of pine trunks or in the crowns. A female deposits on the pine needles about 500 eggs or larvae, some of which find larvae of *P. flammea* and bore into them. The maggot abandons the host only after the latter has entered the ground litter, and pupates near it. Up to 83 per cent. of the pupae of *E. rudis* were themselves parasitised by the Bombyliids, *Hemipenthes morio*, L., and *Thyridanthrax* (*Anthrax*) *maurus*, L., the Ichneumonid, *Gelis* (*Pezomachus*) *kiesenwetteri*, Först., and the Pteromalid, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) ; 90 per cent. of the hyperparasitism was due to *H. morio*, the larvae of which hibernate in the pupae of the host and pupate near them at the end of May or in June.

Second in importance of the parasites of *P. flammea* was *Ichneumon pachymerus*, Htg., which appears at the end of May and the first half of June [**21** 529]. The adults are briefly described. The parasitised caterpillars pupate, and the adult Ichneumonid emerges from the pupa in the following year. The Ichneumonid, *Banchus femoralis*, Thoms., parasitised 8 per cent. of the larvae in 1932 ; it reproduces parthenogenetically and attacks fully developed caterpillars. Hyperparasites reared from its pupae were the Ichneumonids, *Plesiophthalmus alarius*, Grav., and *G. kiesenwetteri*, and *H. morio*. This last was also bred from pupae of *Meteorus albiditarsis*, Curt., which parasitised about 2 per cent. of the larvae of *P. flammea*.

Other parasites were : the egg-parasite, *Trichogramma evanescens*, Westw. ; *Henicospilus merdarius*, Grav., *Pales pavida*, Mg., *Phryxe vulgaris*, Fall., *Blepharomyia pagana*, Mg., and *Winthemia amoena*, Mg., the pupae of which were found in the litter ; and *Ichneumon incubitor*, L., *I. bilunulatus*, Grav., *I. nigritarius*, Grav., *Aphanistes armatus*, Wesm., *Anomalon biguttatum*, Grav., *Exochilum circumflexum*, L., two varieties of *Cryptus dianae*, Grav. (both of which also act as hyperparasites), and *Dirhicnus* (*Pteromalus*) *alboannulatus*, Ratz., all of which species pupate in the host pupa. The Bombyliid, *Villa* (*Anthrax*) *hottentota*, L., which is also a hyperparasite of some Ichneumonids, parasitised 3 per cent. of the pupae of *Panolis*.

Predacious enemies included *Calosoma sycophanta*, L., and in many places the larvae were killed by the fungus, *Empusa aulicae*, and by bacterial diseases, and the pupae by *Isaria farinosa*.

In organising a control campaign by dusting from aeroplanes in 1932, it was estimated that measures would only be economically justifiable on stands of trees 30–50 years old. Power dusters were used in small stands and on the outskirts of the large ones. Dusting by aeroplane was carried out in the mornings and evenings (5–7 a.m. and 6–8 p.m.) from 31st May to 23rd June with a few intervals due to unfavourable weather, plots of about 15–17 acres being treated at a time with about 5 cwt. of insecticide to each plot. An area of over 3,750 acres was treated with contact dusts of German and Czech manufacture and about 1,800 acres with calcium arsenate. Excellent results were obtained from the contact dusts both in the laboratory and in the field, where they were much more effective than calcium arsenate [**21** 395]. The young larvae died in about 2 hours, and those in the fourth and fifth instars in 24, 100 per cent. mortality being obtained in many instances. No damage was caused to trees, birds, mammals, or beneficial insects.

Pines dying as a result of infestation by *P. flammea* were often attacked by secondary pests. Dry trees exposed to the sun were infested by the weevil, *Pissodes piniphilus*, Hbst., *Sirex juvencus*, L., the Buprestid, *Anthaxia quadripunctata*, L., and especially *Melanophila* (*Phaenops*) *cyanea*, F., the larvae of which made wide galleries between the bast and bark on the southern and western side of the trunks. The shady side of the stems was infested by *Myelophilus piniperda*, L., and *M. minor*, Htg. Both these Scolytids predominated on trees within the stands where they were little exposed to sunlight. In these situations, the trunks were also attacked by *Xyloterus lineatus*, Ol., and occasionally *Hylastes* (*Hylurgops*) *palliatus*, Gyll., and *Crypturgus cinereus*, Hbst., and the tops of the trees and branches by *Ips acuminatus*, Gyll., which was abundant, and by smaller numbers of *I.* (*Pityogenes*) *quadridens*, Htg., *Carphoborus minimus*, F., *Pityophthorus lichtensteini*, Ratz., *P. pubescens*, Marsh. (*ramulorum*, Perris), *Pogonochaerus fasciculatus*, DeG., and *Magdalis frontalis*, Gyll. Trap trees felled in early summer were chiefly infested by the two species of *Myelophilus*, *Ips proximus*, Eichh., *I. laricis*, F., the Lamiid, *Acanthocinus aedilis*, L., and the Cerambycid, *Rhagium inquisitor*, L. Trees cut down later were infested by *I. sexdentatus*, Börn. (at the base) and *I. acuminatus* (in the crown). Trap trees that were left for a long time unbarked were attacked in uninfested parts at the base of the stem by *Ips longicollis*, Gyll., which has not previously been recorded from Czechoslovakia. Pine stumps were attacked by *Chalcocophora mariana*, L., and *Buprestis rustica*, L., which were

abundant, *A. aedilis*, the Prionid, *Ergates faber*, L., the Cerambycid, *Criocephalus rusticus*, L., and the Scolytids, *Hylastes ater*, Payk., *H. linearis*, Er., *H. angustatus*, Hbst., *H. attenuatus*, Er., *H. opacus*, Er., *Hylurgus ligniperda*, F., and *M. piniperda*. *Xyleborus eurygraphus*, Ratz., the females of which tunnel long galleries in the bark down to the wood, was rare.

Jancke (O.). **Befall einer Himbeerpflanzung durch die Himbeergallmücke** (*Lasioptera rubi* **Heeg. Dipt. Cecid.**). [The Infestation of a Raspberry Plantation by the Raspberry Gall-midge.]—*NachrBl. dtsch. PflSchDienst* **14** no. 5 pp. 45–47, 4 figs., 11 refs. Berlin, May 1934.

Lasioptera rubi, Heeg., has been recorded as a pest of raspberries in Britain [*R.A.E.*, A **9** 528 ; **16** 422], but in Germany and elsewhere on the Continent its galls in raspberry stems have not been considered harmful [but *cf.* **21** 680]. In 1933, about 20 per cent. of the canes in a plantation near Naumburg a. S. were infested. The structure of the galls is described. There were 1–14 larvae or pupae per gall, with an average of 6. Near Naumburg, the first pupa was found in a gall opened on 9th May, but full-grown larvae were still present in July. Adults emerged between 26th May and 12th June. Parasites, if present, usually occurred singly, two being the maximum number found in a gall. The only species bred from the galls was *Callimome* (*Torymus*) *macroptera*, Wlk. Other parasites of *L. rubi* previously recorded from Germany are *Eurytoma aterrima*, Schr., *Eupelmus vesicularis*, Retz. (*degeeri*, Dalm.), *Tetrastichus brevicornis*, Nees, and *Platygaster hyllus*, Wlk.

Most of the infested canes died during the second summer, and those that survived produced less fruits. Infested canes should be cut out and burnt in spring, and wild raspberry and blackberry plants cleared away. The author disagrees with Tillyard's view [**15** 318] that the large galls of *L. rubi* stimulate rather than check growth.

Behlen (W.). **Die Erbsenlaus** (*Macrosiphon onobrychis* **B. d. F.**), **ein äusserst gefährlicher Luzerneschädling.** [The Pea Aphis, an extremely dangerous Pest of Lucerne.]—*NachrBl. dtsch. PflSch-Dienst* **14** no. 5 pp. 48–51, 3 figs., 8 refs. Berlin, May 1934.

Early in May 1933, lucerne fields in Prussian Silesia were very severely attacked by *Macrosiphum onobrychis*, Boy. The infestation spread from the centre to the edges of the fields, and the plants withered and died. In one field, red clover growing among the lucerne was not attacked until after the latter had been destroyed. In Anhalt (central Germany), similar destructive infestations were observed ; they have not previously been recorded in Germany. An account of the life-history is given from the literature.

Trappmann (W.) & Nitsche (G.). **Methoden zur Prüfung von Pflanzenschutzmitteln. VII. Eine einfache Dosierungsvorrichtung für Spritzmittel bei Laboratoriums-Versuchen.** [Methods for testing Insecticides and Fungicides. VII. A simple Apparatus for determining Dosages of Spray Materials in Laboratory Experiments.]—*NachrBl. dtsch. PflSchDienst* **14** no. 5 pp. 51–52, 1 fig., 2 refs. Berlin, May 1934.

The apparatus described is a simplification of that used by Görnitz [*R.A.E.*, A **21** 385]. The balance is not enclosed in a cupboard, the

dividing wall is replaced by a sheet of tin, and the spray is applied from about a yard away to leaves resting on the celluloid square. In some preliminary tests, a contact spray was applied direct to larvae placed on the square.

SUBKLEW (W.). **Die Bekämpfung der Drahtwürmer.** [Wireworm Control.]—*NachrBl. dtsch. PflSchDienst* **14** no. 5 pp. 52–53. Berlin, May 1934.

The author has prepared in manuscript an annotated bibliography of 1,200 references on the control of wireworms. This is available for consultation at the Biologische Reichsanstalt at Kiel, a very brief survey of the main points relating to control being given here.

Bericht über die Konferenz der Gesellschaft für Vorratsschutz über die Kornkäferfrage. [Report on the Conference of the Gesellschaft für Vorratsschutz on the Question of *Calandra granaria*.] —*Mitt. Ges. Vorratsschutz* **10** no. 3 pp. 25–28. Berlin, May 1934.

In a conference on the problem of infestation of stored grain by *Calandra granaria*, L., held on 29th March 1934, Dr. F. Zacher drew attention to the annual loss this weevil causes in Germany, which is estimated at over £4,800,000 [at par]. Experiments have shown that barley is attacked 6 times, and wheat and rye 40 times as severely as oats [*cf. R.A.E.*, A **20** 563].

DAVIES (W. M.). **Studies on Aphides infesting the Potato Crop II. Aphis Survey : Its Bearing upon the Selection of Districts for Seed Potato Production.**—*Ann. appl. Biol.* **21** no. 2 pp. 283–299, 6 figs., 2 pls., 9 refs. London, May 1934.

Surveys were made during 1928–33 of the Aphids on potato in 5 of 15 centres in North Wales [*cf. R.A.E.*, A **21** 2] into which virus-free stock had been introduced, 3 being successful sources of healthy seed and 2 unsuccessful ones that were discarded in 1930 owing to the rapid increase in virus infection, particularly leaf-roll. The different species observed [*cf.* **21** 126] are described. Wingless forms of *Myzus persicae*, Sulz., were found hibernating in large numbers on winter crucifers, particularly savoy cabbages, and these plants are considered to be the main source of winged migrants in spring in most districts. The greatest migration normally occurs in early June (largely from an easterly direction) and the migrants continue to move from plant to plant for about a month. Winged forms are not common during July and August and do not increase until the late September migration from potatoes. The index of infestation by *M. persicae* (*i.e.*, the number per hundred leaves, which was found to give a reliable indication) always exceeded 100, with a maximum of 1,000 or more, at the "unsuccessful" centres, but did not exceed 20 at the "successful" ones. This index is generally most reliable in mid-July, since in the latest seasons the main migration will have been completed early in the month. It is essential that it should be an index of the intensity of the initial infestation by migrants and their subsequent dissemination, not simply of the rate of reproduction within the field, since if the crop is originally healthy, a rapid increase of apterous Aphids is not followed by a spread of virus diseases.

Edwards (E. E.) & Thompson (J. K.). **On the Pigmy Mangold Beetle (*Atomaria linearis* Steph.) and Methods for its Control.**—*Ann. appl. Biol.* **21** no. 2 pp. 300–318, 2 pls., 12 refs. London, May 1934.

Investigations in the field and laboratory on the Cryptophagid, *Atomaria linearis*, Steph., which has been a serious pest of sugar-beet and mangel in several English counties for many years, were carried out in Lincolnshire and Shropshire during 1928–33. The injury caused by the adults to the roots and foliage is described, and a brief account of the life-history is given [*cf. R.A.E.*, A **20** 310 ; etc.]. The adults were numerous from the beginning of May till about the middle of July. The eggs are presumably laid in the soil near the infested plants. The larvae, which live in the soil adjacent to the root system of the plants, pupated in early August in the laboratory, and young adults were seen in the field in late September ; these hibernated in the soil or in débris. Outbreaks apparently occur only in land in which a susceptible crop has been grown for several successive years. A satisfactory crop has sometimes been obtained in an infested field after an interval of 1 year, but the beetles may live unnoticed during longer intervals on *Chenopodium album* or on remnants of sugar-beet or mangel. Cultural measures for reducing attack include the selection of heavier and more fertile soils, a low potash content being apparently correlated with outbreaks, or the use of manures that stimulate growth and shorten the seedling stage, such as increased quantities of nitrogenous fertilisers with farm-yard manure or with complete minerals on most soils and heavy applications of potash on fen soils. In 1931, the half of a large, slightly infested field that had been rolled twice immediately after sowing and then at weekly intervals until the plants were well established produced 2 tons of washed sugar-beet per acre more than the unrolled half. The use of increased quantities of seed is effective in slight infestations but not in heavier ones, and the postponement of thinning as late as possible helps to a small extent. Severe injury is likely to occur when the weather during the seedling period is cold and either very dry or very moist, so that development is retarded and the period of greatest susceptibility is prolonged.

The effect of various seed and soil treatments on the growth of sugar-beet, the incidence of the beetle and the crop yield is discussed. Seeds steeped for 20 minutes in water containing 5 per cent. magnesium sulphate and 1 per cent. phenol and left to dry germinated satisfactorily ; in 1929 and 1931, the crop from treated seeds was respectively about 3 tons 10 cwt. and 5 tons 7 cwt. per acre more than from untreated ones. The mixture of crude naphthalene with sugar-beet seed (1 : 20) in sowing as a deterrent against the beetle [*cf.* **15** 168] seriously impaired germination.

Different varieties of sugar-beet vary in their susceptibility to infestation, but the differences are generally small and unimportant. Mangels are usually more resistant than sugar-beets. The beetle is recorded for the first time in Britain on garden beet and *C. album*.

Cleare (L. D.). **Sugar-cane Moth-borer Investigations in British Guiana : The present Position.**—*Agric. J. Brit. Guiana* **5** no. 1 pp. 13–21. Georgetown, March 1934.

Investigations are in progress on the ecology and control of *Diatraea* on sugar-cane in Antigua [*R.A.E.*, A **21** 661, etc.], where *D. saccharalis*,

F., is the only species and conditions are comparatively simple, and in British Guiana, where they are complicated by the wet climate and the occurrence of two species of borer, *D. saccharalis* and *D. canella*, Hmps., and of some 16 native parasites [*cf.* **14** 101]. An account is given of work in the latter country since its inception in July 1931. It now appears probable that the resistance of some varieties of cane to attack [**20** 612] is due to the fibrous content [*cf.* **22** 326] and its arrangement.

Examination of two fields of plant cane and two of second ratoon at harvest revealed an average of 10·3 stalks per stool, of which 6·3 were living; of the 47·5 per cent. of the living stalks that were jointed, an average of 94·6 per cent. (or 15·7 per cent. of the joints) were bored by the larvae. Of the dead jointed stalks, 82 per cent. were killed by *Diatraea*. A series of analyses, covering 11 varieties, showed that on an average infestation reduces the percentage of sucrose in the cane by 1. As the average sucrose yield of cane in the Colony is about 11 per cent., this represents a loss to the factories of slightly over 9 per cent. and a substantial monetary loss. In the field, the destruction of the young shoots retards the maturing of the crop, and the power of the plant to ratoon is often affected by the killing of the young shoots before they have developed buds below ground. The total loss caused by the moths to the sugar industry is estimated at 15–20 per cent. of the crop.

Six consignments of the Amazon fly, *Metagonistylum minense*, Tns. [**22** 187] were received from Brazil between the end of August and the end of October 1933. Pyralids of the genus *Diatraea* appear to be the only hosts of this Tachinid. The larvae are deposited at the entrance to a tunnel of the borer, which they enter and destroy almost completely. The pupal period occupies about 8 days, and the life-cycle from larviposition to emergence about 14. A period of 6–7 days elapses between pairing (which occurs within a few hours of emergence) and larviposition. In the laboratory, host larvae were inoculated with maggots from dissected females [*cf.* **19** 214], and the resulting adults were paired before release in the field. The parasite has been recovered in all localities in which it was released, and several generations have developed where the first colonisations were made.

MENOR O. (J. G.). **Un insecto poco conocido que ataca al cocotero en la Republica.** [A little-known Insect that attacks Coconut in the Dominican Republic.]—*Rev. Agric. Com.* **25** no. 54 pp. 1050–1051, 3 figs. Santo Domingo, March 1934.

Though known to occur in Santo Domingo, *Rhina barbirostris*, F., has not been recorded as a pest of coconut there. In a coconut palm killed by a fungus rot, however, the author observed holes in the trunk from which the adults were dug out. Notes are given on the biology and control of this weevil [*R.A.E.*, A **10** 53; **11** 120], which may, it is suggested, have either carried the fungus or facilitated its entrance.

CARTER (W.). **Mealy-bug Wilt and Green Spot in Jamaica and Central America.**—*Phytopathology* **24** no. 4 pp. 424–426, 2 refs. Lancaster, Pa, April 1934.

In Jamaica, certain varieties of pineapple are apparently being exterminated by mealybug wilt caused by *Pseudococcus brevipes*,

Ckll. [*cf. R.A.E.*, A **21** 64]. The variety Cheese Pine was much more resistant than any other. Green spotting was also seen on several varieties, including Cheese Pine. In Guatemala, no green spotting was observed, even though in the lowlands *P. brevipes* was very common on Cheese Pine.

In Honduras, green spotting was found only in one place (on 3 varieties) where the mealybug was rare but to which planting material had been imported from Hawaii [*cf. loc. cit.*]. Areas where green spotting has been observed have all shared in the transfer of plant material at some time. No typical wilt was observed in Honduras, the principal variety there being apparently Cheese Pine.

KLEINMAN (L. W.). **The Effect of Temperature upon the Respiratory Quotients of Nymphs of the Grasshopper, *Chortophaga viridifasciata* DeGeer, and Larvae of the Japanese Beetle, *Popillia japonica* Newman, with Reference to Changes during Hibernation.**—*J. cellul. comp. Physiol.* **4** no. 2 pp. 221–235, 1 fig., 34 refs. Philadelphia, Pa, February 1934.

The following is taken from the author's summary: Both the gaseous exchange and the respiratory quotients of the nymphs of *Chortophaga viridifasciata*, DeG., and the larvae of *Popillia japonica*, Newm., vary directly with the temperature between 7 and 34°C. (44·6 and 93·2°F.). The effects produced by varying temperatures to cause the alteration in the magnitude of the respiratory quotient are unknown. It is suggested that the low respiratory quotients so universally observed in hibernating animals may be ascribed to the direct influence of low temperature upon the organism.

Entomology.—*Bull. Maine agric. Exp. Sta.* no. 369 pp. 551–557, 1 fig. Orono, Me, December 1933. [Recd. May 1934.]

Analysis of the residue on apples from a number of localities in Maine in 1933 indicated that in the last week in September those sprayed with calcium or lead arsenate retained 10–20 and 50 per cent., respectively, of the amount of residue present one month earlier; on 1st October, the residue was below the tolerance [*R.A.E.*, A **22** 183] on fruit treated with calcium arsenate three times during July and early August, but was above it on practically all samples that had received two applications of lead arsenate in July and on all those that had received a third in early August. The apple fruit-fly [*Rhagoletis pomonella*, Walsh] was killed more quickly in laboratory tests by calcium arsenate than by lead arsenate. Most of the flies (97–99 per cent.) had emerged by 10th August in the localities under observation. *Opius melleus*, Gah., *O. lectus*, Gah., and *O. ferrugineus*, Gah., which last is the most abundant parasite, begin to appear after the peak of emergence [*cf.* **17** 272] and continue during August. The eggs are laid in or near the larvae boring in the apples, parasitism being less than 10 per cent. Some of the parasites spend two winters in the ground in the host puparia [*cf.* **21** 256].

Agriotes mancus, Say [**17** 69; **18** 480] is the most injurious wireworm attacking field and garden crops, others being *Melanotus* spp., which attack crops in relatively light soil particularly in the west

and south, *Pheletes* (*Limonius*) *agonus*, Say, which occasionally attacks cultivated plants, species of *Ludius* and *Hemicrepidius*, and *Hypnus* (*Cryptohypnus*) *abbreviatus*, Say. The importance of cultivation in their control was demonstrated; potatoes in plots in which severe injury had been caused in 1931 and 1932 were mostly free from damage when dug before 15th September 1933. Tubers dug on 7th September were less severely injured than those dug during October. Plots that were originally almost free from infestation became infested while under timothy [*Phleum pratense*], some of the potatoes planted the following year being practically valueless [*cf.* **21** 230]. The yield is not materially affected by the use of naphthalene in the soil at the rate of 300–600 lb. per acre. Large numbers of predacious larvae of a Therevid may have been partly responsible for a reduction that occurred in the wireworm population. Sodium chloride had no effect at rates of up to 1,000 lb. per acre, and laboratory tests indicated that an amount effective for control would probably be injurious to growing vegetation. Soil fumigation with hydrocyanic acid gas is effective in summer but not in spring. Graham flour dough sweetened with honey was slightly less attractive to the adults of *A. mancus* than green stems and foliage of clover placed on the soil, but has the advantage of being available when clover is difficult to obtain. In tests for a toxic substance to add to the baits, the beetles were repelled by all except arsenic trioxide.

Infection was not transmitted to healthy potatoes late in the season by small numbers of *Macrosiphum solanifolii*, Ashm., reared on potatoes infected with mild mosaic [*cf.* **20** 569].

Schultz (E. S.), Bonde (R.) & Raleigh (W. P.). **Isolated Tuber-unit Seed Plots for the Control of Potato Virus Diseases and Blackleg in northern Maine.**—*Bull. Maine agric. Exp. Sta.* no. 370, 32 pp., 2 figs., 8 pls., 16 refs. Orono, Me, January 1934. [Recd. May 1934.]

In a section on the effect of roguing on the incidence of virus diseases of potato in northern Maine (pp. 21–24), it is stated that the slow spread of leaf-roll, as compared with mild mosaic, seems to be due to the relative scarcity of the principal vector, *Myzus persicae*, Sulz. [*cf. R.A.E.*, A **19** 459] and the fact that this Aphid appears late in the season, so that the early varieties have often matured and the infection does not reach the tubers of the late ones before the plants are killed by the autumn frosts. *M. solani*, Kalt. (*pseudosolani*, Theo.) is sometimes abundant, but its importance in the dissemination of virus diseases has not been determined. *Macrosiphum solanifolii*, Ashm. (*gei*, auct.) and *Aphis rhamni*, Boy., the commonest Aphids on potato in the area under observation, have often failed to transmit spindle-tuber [*cf.* **21** 289], and the slow spread of this disease may be due to the scarcity of the vectors, *Melanoplus* spp. [**16** 388], *Epitrix cucumeris*, Harr., and *Leptinotarsa decemlineata*, Say. It is considered that the presence of spindle-tuber is due to lack of thorough roguing and that this disease, which is not so widespread as is generally assumed, can be readily controlled by the use of properly conducted tuber-unit seed plots, which are described. The rapid spread of mild mosaic is due to the occurrence of *Macrosiphum solanifolii* [**11** 581], *A. rhamni* and *Myzus persicae* [**21** 289].

Glasgow (H.). **Seed Treatments for Control of Root Maggots.**—*J. econ. Ent.* **27** no. 2 pp. 303–308, 2 figs. Geneva, N.Y., April 1934.

Some insoluble compounds of mercury have been found to be as effective in controlling *Phorbia* (*Anthomyia*) *brassicae*, Bch., on cruciferous crops as the soluble salts in common use (particularly mercury bichloride) and considerably less toxic to the plants. An account is given of tests in New York State in which the seed of various crucifers was coated with calomel (mercurous chloride) as a protection against attack by the larvae. Cabbage seed moistened with a solution of gum arabic and water and then worked up by hand with finely powdered calomel was made to retain 1½–2 lb. of the dust per lb. seed with very little loss or clogging of the seeder. To obtain the best results, seeding should be shallow and dense to ensure a high concentration of the insecticide at the point of attack. Protection was often complete while the seedlings were comparatively small, but some late injury usually developed as the plants increased in size. Seed treatment should therefore be confined mainly to the later planted seed-beds, where maximum oviposition will occur while the plants are comparatively young. Seed treatment with calomel or other compounds of mercury has proved of little value for rapidly growing crops such as radishes or turnips, and seems to have no appreciable result in reducing injury to plants attacked by the seed corn maggot, *P. cilicrura*, Rond.

Of 187 cabbage seedlings from seed treated with calomel, about 60 per cent. were uninjured, 34 per cent. slightly injured, 5 per cent. severely damaged and 1·5 per cent. killed as the result of attack by *P. brassicae*. Only 1·9 per cent. of untreated plants remained uninjured, and 78 per cent. were dead at the time of transplanting.

In a test against *Hylemyia antiqua*, Mg., two of three rows of onion seed were coated with calomel at the rate of 2 lb. per lb., the second row receiving in addition an equal amount drilled in above the seed just before covering, and the middle row receiving no treatment. At harvest, the total loss due to the maggots was 95 per cent. in the untreated row and 18 per cent. in the row receiving only seed treatment. No injury developed in the row receiving double treatment. The amount planted per acre was 20–24 lb. of the cabbage seed and about 50 lb. of the onions. Repeated tests have shown that when the regular rate of seeding is used for onions, treating the seed does not ensure satisfactory control of *H. antiqua*, as the concentration of the calomel is insufficient.

Rawlins (W. A.). **Experimental Studies on the Wheat Wireworm *Agriotes mancus* Say.**—*J. econ. Ent.* **27** no. 2 pp. 308–314, 3 refs. Geneva, N.Y., April 1934.

Of the wireworms attacking potato in New York, *Agriotes mancus*, Say, is the most numerous, 90 per cent. of the injury being attributed to it. *Pheletes* (*Limonius*) *ectypus*, Say, *Hemicrepidius memnonius*, Hbst., and *Melanotus* sp. are minor pests, though not uncommon in most of the potato regions of the State. Conflicting evidence as to the best methods of controlling wireworms [*R.A.E.*, A **19** 120] is discussed. Experimental workers appear to agree that the sod or grass crop is the source of infestation by *A. mancus*, and it has been stated that a rapid decrease in the numbers of wireworms results from continuous cultivation following the breaking up of grass lands [**12** 128].

Studies in New York showed that the eggs of *A. mancus* are laid in May or June and hatch in about a month. A single brood took 3–5 years to complete its full life-cycle. The pupal stage lasted 3–4 weeks, and adults emerged in August but did not leave their earthen cells until the following spring, when they made their way to the surface. During the spring, they hid under stones and clods of earth, crawling into the cracks of the soil or the crowns of sod plants when the weather became warm. About 45 per cent. of the wireworms arising from a single infestation become beetles in 3 years, an equal number in 4 years and the remainder in 5 years.

Experiments described indicate that the most satisfactory method of controlling *A. mancus* is the adoption of suitable crop rotations. Where potatoes are injured, it is advisable to eliminate the sod crop of clover and timothy [*Phleum pratense*] from the rotation. Infestation starts in fields planted to hay or sod, and the wireworms increase in numbers if the ground is left in sod for two consecutive years. The beetles occur in large numbers even in cultivated fields in the second and third years following a sod, and a few emerge the fourth year. Marked decreases in larval populations and consequent injury to potato tubers will result from continued cultivation of infested fields.

Felt (E. P.). **Dutch Elm Disease Control and the Elm Bark Borer.**—*J. econ. Ent.* **27** no. 2 pp. 315–319. Geneva, N.Y., April 1934.

Dutch elm disease, caused by *Graphium ulmi*, which is now generally established in the metropolitan area of New York, is a serious menace to all species of elms in the United States. The recognition of *Scolytus multistriatus*, Marsh., as probably the principal vector in the United States [*R.A.E.*, A **22** 314] renders information on it of great importance.

A careful study made by J. W. Chapman in 1909 and for some years following, when it was supposedly very injurious to elms in Massachusetts, showed the longest galleries to contain as many as 140 eggs, though usually not more than 80. Oviposition continued for several weeks, so that a gallery might contain both eggs and partly developed larvae. The first brood in New England deposits eggs at the end of May and in June, and there is a second major oviposition period at the end of August and early in September. The larvae of the last brood hibernate in the inner bark and complete their development in the following spring. The pupal cells are in the outer bark just under the surface. Recent observations by W. M. Blackman indicate that some of the beetles are in flight at all times during the warmer months. It has also been shown that they feed on the buds and in the crotches of the smaller branches and that dissemination of Dutch elm disease by beetles issuing from infected trees may be due to this habit. A close relation was observed between abundance of the beetle and prevalence of the disease. The possibility of controlling the disease is thus largely dependent on the abundance of trees suitable for the breeding of *S. multistriatus* and the flight habits of this beetle. Infection starts in the small branches and produces a progressive dying of the wood, speedily killing the trees if it is general. The Scolytid finds favourable breeding conditions in the sickly trees, 6 sq. inches of bark producing as many as 28 beetles. It was estimated that an elm with a trunk diameter of $3\frac{3}{4}$ ft. might produce a million and a half beetles.

Available data indicate that the importation of elm logs infected with *Graphium ulmi* and infested by *S. multistriatus* was probably the

means of establishing and spreading the disease in the United States. *S. scolytus*, F., which in Europe is considered the more dangerous species, although found in imported elm logs in the United States, has not yet become established there. Instances are cited of recent infection of scattered elms that suggest that adults of *S. multistriatus* had flown to them in numbers from distances of 20–25 miles. This habit of flight and concentration on favoured trees is also characteristic of a number of other bark-beetles. The presence of *G. ulmi* in New York threatens the elms of New England, since the prevailing winds are likely to facilitate movement of beetles in that direction.

S. multistriatus is mainly limited to sickly or dying wood, and larvae from eggs laid freely on healthy trees have failed to develop. Thus systematic cutting and burning of sickly and dying trees is a practical method of controlling the beetle. As the disease may occur in new and possibly distant localities, tree sanitation is recommended over an area reaching from New Jersey to southern Maine and extending 100–250 miles back from the coast. This would reduce opportunities for further dissemination and increase the chances of actual eradication, which appears to have been accomplished in Ohio. Adherence to the spraying programme designed to control leaf-feeders will keep the trees in good condition by protecting the foliage, and will largely prevent the development of sickly and dying wood.

Collins (C. W.) & Baker (W. L.). **Exploring the Upper Air for Wind-borne Gipsy Moth Larvae.**—*J. econ. Ent.* **27** no. 2 pp. 320–327, 1 pl., 3 refs. Geneva, N.Y., April 1934.

Previous experiments [*R.A.E.*, A **3** 710; **5** 215] indicated that carriage of the larvae by wind is the chief agency effecting the spread of *Porthetria dispar*, L. Dispersion has also been found to be more prevalent in New England when warm surface winds are coming from the west. Records indicate that during a 40-year period *P. dispar* spread 2–2½ times as rapidly towards the north-east and south-east as towards the north-west and south-west, owing to the prevailing westerly winds. To study this problem further, aeroplane flights were made in 1932 and 1933 over a heavily infested area in Massachusetts. A trap composed of wire screens [**19** 633] covered with a sticky substance that would be effective at low temperatures was used.

Although only four first-instar larvae of *P. dispar* were taken during the two seasons of flight, one at an altitude of 300–500 and two at 1,000 ft. in 1932, and one at 2,000 ft. above sea-level in 1933, the result is considered satisfactory, in view of the relatively small area that could be covered in the flights. With the screen used in 1933, it would require more than 25 years of continuous flight and exposure to filter the air in 1 cubic mile, and only 1 part in 125,000 of the air above one acre to a height of 2,000 ft. was sampled by the trap when the larva was taken at that altitude. Thus the chance of capturing a larva was unbelievably small unless a multitude of them were afloat above the forest crown at the time.

Brown (R. C.). **Notes on the Beech Scale, *Cryptococcus fagi* (Baer.) Dougl., in New England.**—*J. econ. Ent.* **27** no. 2 pp. 327–334, 3 figs., 5 refs. Geneva, N.Y., April 1934.

Cryptococcus fagi, Bär., was introduced into Nova Scotia [*R.A.E.*, A **2** 204] and the United States [**20** 282, 300] probably from Europe, where

it causes considerable damage to European beech (*Fagus sylvatica*). In North America, it attacks both this tree and the native *F. grandifolia*. It has now been found in 5 areas in New England, the largest and most severely infested being in Maine, and further intensive scouting may reveal a continuous infestation from Boston to New Brunswick. Near Boston, oviposition begins about 15th June and reaches a maximum in July. Hatching continues throughout August and into September. The crawlers settle on the bark when they find suitable positions under lichen or in crevices, and complete their development there, secreting white woolly wax for the remainder of their lives. Mature females deposit eggs in this woolly covering. There is one generation annually, and reproduction appears to be entirely parthenogenetic, males being unknown. Dispersal is accomplished largely by wind, eggs and larvae being borne in clumps of dislodged wool, though birds and squirrels may also be concerned. The scale attacks the trunk, branches and exposed roots of beeches of all ages.

The Coccinellid, *Chilocorus stigma*, Say (*bivulnerus* Muls.), is the only effective predator found throughout the infested area. The Lampyrid, *Photinus* (*Lucidota*) *corruscus*, L., was found in eastern Maine to be more abundant where *C. fagi* was present.

A survey in south-eastern Maine showed that *Nectria* sp., although it seems to be definitely associated with the scale [*cf.* **21** 167], has not yet become abundant. Of 1,850 beeches examined, 45·1 per cent. were infested by the scale, 3·1 per cent. by the fungus, and 7·4 per cent. by slime fluxes, *C. fagi* being found on over 90 per cent. of the trees infested by *Nectria* and slime fluxes. The general health of trees infested by the scale is greatly impaired. If conditions in south-eastern Maine are favourable to it and to *Nectria*, it would appear that the infestation by both scale and fungus is comparatively recent, as no condition yet exists such as is described in the Maritime Provinces of Canada [**21** 167]. One plot in which 42 out of 50 trees were infested with the scale showed no trace of the fungus, and even where the latter does occur, infestation by it is usually light. More intensive scouting should be done in order to determine the present distribution of *C. fagi*, after which the eradication of small isolated infestations should be attempted, though control in forest stands would be extremely difficult.

FRIEND (R. B.) & WEST, jr. (A. S.). **Spray Experiments for the Control of the European Pine Shoot Moth.**—*J. econ. Ent.* **27** no. 2 pp. 334–336, 3 refs. Geneva, N.Y., April 1934.

Various methods and materials hitherto employed for the control of *Rhyacionia buoliana*, Schiff., are discussed from the literature [*R.A.E.*, A **21** 567; **22** 288; etc.]. In Connecticut in 1933, blocks of 50 infested trees (*Pinus resinosa*) averaging 6 ft. in height were sprayed with 3 lb. lead arsenate and either 2 U.S. gals. light summer oil or 1 U.S. qt. fish oil in 100 U.S. gals. [*cf.* **21** 234]. In a second series of tests, blocks of 4–5 trees 10–15 ft. in height were sprayed with 3 lb. lead arsenate, $\frac{1}{2}$ (or $\frac{1}{4}$) U.S. gal. nicotine sulphate and $\frac{1}{2}$ U.S. gal. penetrol in 100 U.S. gals. The sprays were applied on 13th and 23rd June and 3rd July from a spray gun with 200 lb. pressure, about 2 U.S. gals. spray per tree being used in the former tests and 3 U.S. gals. in the latter. It is essential that enough spray should be used to run down the twigs and needles and accumulate at the

needle bases. Control was estimated by examining all tips in the former series and only those of the 4 upper whorls and the leader in the latter. The percentage obtained was 95 for those treated with fish oil-lead arsenate, 93 for summer oil-lead arsenate, and 94 and 80 respectively for the sprays containing nicotine sulphate. As the summer oil spray severely scorched the foliage and the cost of the nicotine-penetrol mixture is excessive, lead arsenate with fish oil seems to be the most practicable, though it leaves a visible coating for some time. It may be possible to omit either the second or third application, but single applications on 3rd July proved wholly ineffective, as did 3 applications of calcium arsenate dust applied to trees 20 ft. high.

NASH (R. W.). **The Willow Flea Weevil,** *Orchestes rufipes* **Lec., and its Control in Maine.**—*J. econ. Ent.* **27** no. 2 pp. 336–339, 3 refs. Geneva, N.Y., April 1934.

Rhynchaenus (*Orchestes*) *rufipes*, Lec., was first observed in Maine in 1926, when it caused slight damage to *Salix pentandra*; in August 1931, the foliage was entirely browned or spotted by the larval mines. Although this weevil is very widely distributed throughout the United States and in Canada, it had only previously been recorded in abundance from Ontario, New Jersey [*R.A.E.*, A **10** 114] and Utah [**10** 382]. A list is given of 16 trees and plants on which the adults feed when growing near willow, their principal food-plant. The larvae confine their attack almost entirely to willow, but have occasionally been found on poplar. *S. pentandra* is invariably the species most seriously mined, but, in addition to native willows, *S. babylonica* is also attacked. The adults feed early in the season on the tips of sprout growth, often killing them, but most of their feeding is done on the lower surface of the leaves. The mining of the leaves by the larvae causes the most severe injury, trees infested by them appearing as if scorched by fire. On willows that are cut back each year, only the ornamental value is generally affected, but repeated injury to uncut trees results in the dying back of tip growth, a generally weakened appearance and sparse foliage.

There is only one generation a year. The adults hibernate in soil beneath trees or in other sheltered places and begin to emerge in mid-May when the willow buds open. They feed in May-July, and begin to oviposit about the middle of June in the leaf tissue, in cavities similar to feeding punctures. Observation of caged weevils shows that oviposition continues for about a month, and the egg stage lasts 10 days. The larvae pupate in the mine, and the life-cycle from egg to adult takes about 50 days. The adults are very abundant at the end of August, when they feed before going into hibernation with the advent of the first frosts. All stages are briefly described.

Lead arsenate sprays and dusts of sodium fluosilicate combined with lime failed to control the weevils, and Bordeaux mixture used as a repellent gave inadequate results. A contact spray of nicotine sulphate (1 : 600) and liquid potash soap (1 : 500) proved the most effective, though two applications were required to give 99 per cent. control. The first treatment is applied about 19th June against adults and eggs, and the second 3 weeks later against larvae and eggs. One application effected 93 per cent. control and greatly improved the appearance of the foliage. As spraying causes the adults to drop to the ground, the soil beneath the trees should also be sprayed.

Peirson (H. B.) & Gillespie (A. M.). **Some Observations on the Balsam Woolly Aphid in Maine.**—*J. econ. Ent.* **27** no. 2 pp. 340–341, 2 refs. Geneva, N.Y., April 1934.

Chermes (*Adelges*) *piceae*, Ratz., has recently become very destructive to balsam fir (*Abies balsamea*) in Maine, where it was found during the past three years in 34 townships scattered over the southern half of the State. The injury caused by it is described [*cf. R.A.E.*, A **21** 283]. There are at least two generations a year in Maine. The overwintered forms [*cf.* **22** 313] reach maturity about the middle of June and oviposit round and beneath the bark scales or on the smooth surface of the bark. Larvae in the crawling stage are abundant for the first 3 weeks of July. At the end of August, eggs are laid that hatch during September, producing the overwintering forms. All stages are briefly described.

Experiments in 1932 and 1933 have shown that this Aphid may be satisfactorily controlled on valuable trees by spraying with nicotine sulphate (1 : 600) and either 0·5 per cent. penetrol or 1 per cent. summer oil during mid-June or mid-August. The entire tree should be drenched with a high-pressure sprayer in order to kill the eggs and ovipositing females, which are well protected by waxy secretions, and the immature forms beneath the bark scales and on the tips of new growth. No means of control in forests has yet been found, and owners are advised to fell infested trees and either remove or burn them to prevent the spread of the Aphid through the rest of the stand. No natural control has been observed in Maine.

Brower (A. E.). **Predatory Checks, especially Birds, on the Birch Leaf-mining Sawfly, *Phyllotoma nemorata* Fallen.**—*J. econ. Ent.* **27** no. 2 pp. 342–344. Geneva, N.Y., April 1934.

The most important natural enemies of *Phyllotoma nemorata*, Fall., a serious pest of white birch [*Betula papyrifera*] in Maine [*cf. R.A.E.*, A **21** 476; etc.], are birds, which destroyed 10 per cent. of the larvae and prepupae in 20 representative plots in 1929. The percentage of the hibernacula destroyed within 30 days of their formation was 18·24 in 1931, 53·43 in 1932 and 47·96 in 1933, all within a period 15 days before and 15 days after the fall of the infested leaves. Tree-feeding birds destroyed 20 per cent. of the larvae by removing them from their mines in the growing leaves. The species of birds concerned are recorded, no scientific names being given.

Other predatory enemies, which appear to be much less important, are Chrysopid larvae, ants, wasps and other Hymenoptera, shrews, mice, Carabids and wireworms. This great destruction of an introduced insect by birds is the more remarkable as they have not been observed feeding on native leaf-miners in Maine. The remarkable increase in the percentage destroyed indicates that the birds have acquired a new food habit.

Plumb (G. H.) & Hicock (H. W.). **Insect Control Work by the Civilian Conservation Corps in Connecticut.**—*J. econ. Ent.* **27** no. 2 pp. 344–345. Geneva, N.Y., April 1934.

The work in Connecticut in 1933 was devoted to two projects dealing respectively with the control of *Pissodes strobi*, Peck, and *Rhyacionia buoliana*, Schiff., on pines. Measures against *P. strobi*

were carried out between 25th June and 15th August from 7 camps, 1,500,000 trees on 10,000 acres being examined and 35,000 infested tops removed. Infestation in different areas ranged from 0 to 50 per cent. The cost ranged from 0·5 to 7·5 man-hours per acre, the trees in the latter instance averaging about 7 ft. in height (average infestation 30 per cent.) and 183 tips being removed per acre. In the attempt to control infestation by *R. buoliana*, which is generally heavy throughout the south-western part of the State and moderate or light elsewhere, an effort was made to confine the infestation to its present limits by inspecting every plantation of red and Scots pine [*Pinus resinosa* and *P. sylvestris*]. Control measures consisted in removing and burning all infested tips, except where trees were injured beyond hope of recovery, when they were cut down and burnt.

WORTHLEY (H. N.). **A second Report on Codling Moth Bands in Pennsylvania.**—*J. econ. Ent.* **27** no. 2 pp. 346–352, 3 refs. Geneva, N.Y., April 1934.

In further studies in Pennsylvania with beta-naphthol bands on apple trees against *Cydia* (*Carpocapsa*) *pomonella*, L. [*cf. R.A.E.*, A **21** 69], the percentage of summer-brood moths that emerged from cocoons in the bands was less than 1 in 1932, when 6·2 inches of rain fell in July and August, and less than 2 in 1933, when 16 inches fell. In 1932 a cold-dipped band with oil of 102 viscosity allowed 2·9 per cent. emergence, but in 1933 the best band was cold-dipped, using 300-viscosity oil. Variations in the toxicity of bands [**21** 332] seemed to be due more to differences in the uniformity and persistence of the chemical coating than to the weight of chemicals deposited. The kill was higher within the tunnels of a corrugated strawboard band than between the band and the bark of the tree, and treatments of sufficient uniformity and persistence to kill a high percentage of larvae in the latter situation were the most effective.

Larvae preferred 3 thicknesses of burlap to 1 or 2, but corrugated strawboard was more attractive. No marked differences in the trapping ability of freshly treated bands appeared, even as between 4-inch and 2-inch ones, but there was no overcrowding of larvae. The tendency of the larvae to wander was less marked in the strawboard than in the burlap, and in freshly treated bands they became paralysed very quickly. In many of the treated bands, 95 per cent. of the larvae died during the test; when the temperature rose to 90°F., they were usually all killed.

On the assumption that the great majority of the larvae pupate on the trees, even in sod orchards, it was estimated that on scraped trees 70–96 per cent. reached the bands [*cf.* **21** 69], the remainder being found in scars, split branches, etc., which were plentiful in the upper parts of the trees. On the unscraped trees, 67 per cent. were in such places. Repeated examination of banded trees in one locality throughout the summer of 1933 showed that, whereas only 0·7 per cent. of the larvae in the bands reached the adult stage, emergence from the 18·8 per cent. of the cocoons that occurred elsewhere totalled 39·1 per cent. The effect of these and similar records quoted in modifying estimates of the actual value of scraping and banding is discussed. The high percentage of pupation among larvae remaining outside the bands makes thorough scraping and pruning of paramount importance.

A comparison of the cost of banding, estimated from figures for different types of orchards on the assumption that at least ½ hour should be allowed for scraping and pruning each tree, shows a total of £2 16s. [at par] per 100 trees for treated strawboard bands as compared with £3 4s. for untreated burlap bands (with 10 inspections), to avoid 85 per cent. of the normal attack of second-brood larvae and to effect a reduction of 90 per cent. in the winter survival. The cost of treating bands does not equal that of adequate inspection of untreated ones, and more than 1 per cent. may be expected to escape inspection. Time spent in inspecting bands could also be better employed in thinning to break clusters and to remove infested fruit.

Bourne (A. I.), Thies (W. H.) & Shaw (F. R.). **Some Observations on long Distance Dispersal of Apple Maggot Flies.**—*J. econ. Ent.* **27** no. 2 pp. 352–355, 2 figs. Geneva, N.Y., April 1934.

The presence of unsprayed apple trees near commercial orchards was found to be an important factor limiting successful control of *Rhagoletis pomonella*, Walsh, in Massachusetts. Numerous local outbreaks were, however, difficult to explain on the current assumption that the flight range of this fruit-fly does not exceed 200–250 yards [*R.A.E.*, A **21** 330]. About 1,000 marked flies were released on 21st July in a region of intense cultivation, where the nearest apple trees in bearing were situated at distances of 568 and 600–700 yds. to the north-east, and the only significant intervening barriers were a row of trees 50–100 yds. and a group of buildings 580 yds. away. Daily observations were made of these apple trees for a month. On 5th August one marked fly was caught on an apple tree 728 yds. from the point of release, and later another (doubtful) example at 568 yds. distance. The prevailing winds were west and south-west and coincided with the days most favourable for the flight of the flies, but their effect was partly neutralised by the double barrier intervening. The points of observation were no doubt beyond the range of normal, though evidently not of possible, flight.

Whitcomb (W. D.). **The Apple Leaf-curling Midge, a new Pest of Apples.**—*J. econ. Ent.* **27** no. 2 pp. 355–361, 1 fig., 3 refs. Geneva, N.Y., April 1934.

A Cecidomyiid tentatively identified as *Dasyneura mali*, Kieff., which was recorded, apparently for the first time from North America, from Massachusetts in 1928 on apple, was discovered in 1932 to have increased considerably in the originally infested orchard and was present in several other neighbouring properties [*cf. R.A.E.*, A **20** 644 ; **21** 228]. An organised search in 1933 showed its presence over an area of about 1,000 sq. miles in north-eastern Massachusetts and south-eastern New Hampshire including some of the largest commercial orchards in New England. Many of the recently discovered infestations were well established, and it was reported that rolled apple leaves had been seen for 5 years. Although the adults found in New England are slightly larger, they agree otherwise very closely with the original description of *D. mali*, which is quoted, but the larvae do not correspond in appearance with either the original description or that of Barnes [**19** 612]. *D. pyri*, Bch., which is morphologically

almost identical but attacks pear only, has been recorded from the Hudson Valley [**20** 530]; the species in New England has not been found on pears surrounded by heavily infested apple trees. Although it appears to prefer certain varieties of apple, none was found to be immune. Injury is confined to the foliage on terminal branches and suckers. The rolled leaves fall prematurely, and growth is slightly delayed and stunted. On young trees, this type of injury is very undesirable. On large trees, 2–6 of the leaves on almost every terminal branch are sometimes rolled by the first or second generation. Wild or neglected trees making little or no new growth are seldom attacked.

The eggs, which are laid irregularly in batches on the margin or upper surface of unfolding leaves, hatch in 3–5 days. The leaves are rolled from the underside upward toward the mid-vein and parallel to it. The larvae live entirely within the tube thus formed and cannot survive exposure to bright sunshine. No actual destruction of the epidermis or pubescent hairs due to larval feeding has been observed. Larvae transferred to newly opened leaves made no attempt to roll them and died within 24 hours. The number of larvae to a leaf varied from 9 to 30. The feeding period is about 20 days. Most of the full-grown larvae fall to the ground, leaving by the ends of the rolled leaves, and pupate in tough white cocoons spun just beneath the surface or among loose pebbles. A few, however, pupate in the leaves. In rearing cages, the adults emerged after 13–18 days and lived only 3–4 days. Their sudden appearance at widely separated places indicates that they are strong fliers, or can be carried by strong winds. Several females will oviposit on one leaf, and one female may oviposit on several leaves. Only leaves that are about two-thirds or less unfolded are selected, and in early June, during rapid foliage growth, the leaves are in the required condition for only about two days. All stages are briefly described.

There are apparently 4 generations a year in Massachusetts; the last two vary in numbers because of their dependence on suckers, both being generally rather small. In 1933, rolled leaves containing young larvae were first seen on 18th May, but were not abundant until 6th June, the principal oviposition period being about 10 days after blossoming. The second brood of larvae, which was abundant from 15th July till 1st August, was about as numerous as the first. Newly rolled leaves were again observed on suckers on 25th August and again in late September.

No natural enemies were found early in the season, but in September an Anthocorid, probably *Orius* (*Triphleps*) *insidiosus*, Say, was often seen attacking larvae in rolled leaves and a few examples of an undetermined Hymenopterous parasite were reared. Similar natural enemies have been observed to attack *D. pyri* in New York, where they considerably reduced its abundance in 1933. It is obviously impossible to reach the larvae in the curled leaves by means of sprays, but summer pruning, cultivation and soil insecticides might be used to prevent extensive damage.

GARMAN (P.). **Studies on Control of the White Apple Leafhopper in Connecticut.**—*J. econ. Ent.* **27** no. 2 pp. 361–364, 1 fig. Geneva, N.Y., April 1934.

An investigation of the bionomics [*R.A.E.*, A **21** 512] and control of *Typhlocyba pomaria*, McAtee, undertaken on account of its unusual

abundance on apple in Connecticut in 1929–30, remains incomplete, owing to subsequent rapid decline in the numbers of the Jassid, but the data so far obtained are being published. In severe infestations, sprays will probably have to be applied in both spring and autumn ; where there is likely to be migration from outside trees, additional applications may be required. Counts in 1933 indicated that an infestation of 150 second-brood nymphs to 100 leaves could be disregarded, whereas in 1932 one of 250 caused considerable damage, so that 200 may be regarded as about the limit of safety. Where only one treatment is required, autumn application of contact sprays is probably rather more effective than spring application of the same materials combined with fungicides and stomach poisons, which also destroy beneficial parasites. One of the main objections to autumn treatment is that the trees are then difficult to spray thoroughly without knocking off the fruit.

The results of spraying experiments against the nymphs in 1932 and 1933 are shown, together with their relative cost. Nicotine sulphate, anabasine sulphate and free nicotine, all of which have given satisfactory results at dilutions of 1 : 800 without the addition of soap or an activator, were found to be the most promising materials for spring use. Among possibilities for autumn sprays, pyrethrum-soaps and similar preparations appear to be as effective as nicotine sulphate, but cost more.

Hutson (R.). **Observations on the Habits and Control of** *Glossonotus crataegi* **(Membracidae), on Plum and Apples.**—*J. econ. Ent.* **27** no. 2 pp. 365–367, 3 refs. Geneva, N.Y., April 1934.

Observations on *Glossonotus crataegi*, Fitch, in 1931–33 in Michigan, where this Membracid had not previously been known to occur in numbers, showed that its food-plants are quince, crab-apple and hawthorn [*Crataegus*]. It overwinters in the egg stage and normally completes its life-cycle on one plant. It has been reported from the northern and north-eastern States as far west as Nebraska. Its oviposition punctures, which do not cause marked scarification of the twigs and smaller branches like those of other Membracids [*cf. R.A.E.*, A **22** 349], are most numerous in wood 1–2 years old. Hatching occurs during May or early June. Nymphs were observed feeding on the stems of plums in late June 1931 ; as many as 18 were observed on the stem of a single fruit, though the average was about 5. When feeding in large numbers, the nymphs excrete quantities of honey-dew. The immediate results of feeding were indefinite watery areas, which dry up within a day or two, interfering with the water relations of the fruit. An abscission layer is formed and the plums drop, or they remain on the tree and a corky scar is developed. The number of punctures required to cause dropping is variable ; later in the season, as many as 5 scars may be found on the stem of a plum that remains on the tree. Both nymphs and adults were observed in 1933 to be extremely gregarious on apple, as many as 150 being found on a branch 2 ft. long and $\frac{1}{4}$ inch in diameter. Large quantities of honey-dew were excreted, and the leaves on infested branches became sickly and began to drop. Suckers on apple were occasionally attacked. As the crop in the orchard under observation was very light, the effect on the fruit could not be noted.

The outbreak on plum occurred in an orchard that had been regularly sprayed for 3 years with commercial oil against San José

scale [*Aspidiotus perniciosus*, Comst.] and European red mite [*Paratetranychus pilosus*, C. & F.], and the apple orchard had been regularly sprayed with 3 per cent. lubricating oil, so that it is evident that dormant oil sprays do not adequately control this treehopper [*cf. R.A.E.*, A **18** 371]. Sprays containing ½ pint nicotine sulphate and either 1 gal. summer oil emulsion or ½ gal. penetrol in 100 gals. completely controlled the nymphs, but various nicotine and pyrethrum dusts proved ineffective. None of the insecticides tested had any effect on the adults.

Hammer (O. H.). **Experiments with Kerosene Emulsions against the Apple Curculio** (*Tachypterellus quadrigibbus* **Say**).—*J. econ. Ent.* **27** no. 2 pp. 367–369. Geneva, N.Y., April 1934.

As control of *Tachypterellus quadrigibbus*, Say, by collecting the fallen apples [*R.A.E.*, A **21** 353] or using pigs to destroy them [**16** 504] is not always practicable and the stomach poisons commonly used for spraying apple trees are not effective [**21** 337], tests were carried out in New York with kerosene or petrol (emulsified with 1 lb. finely divided clay per U.S. gal.) against the weevils on the ground. Adults sprayed on the ground with 50 per cent. emulsions were all killed within 24 hours. In tests with infested apples on the ground, 50 and 25 per cent. kerosene emulsions killed all the weevils, but lower concentrations could not be depended upon. Saturated solutions of naphthalene or paradichlorobenzene in kerosene or petrol were no more effective than the oils alone, and sometimes less so. In a few tests made with pine oil emulsions, the concentrations used had very little effect on the weevils. So far as could be determined, the trees suffered no ill effects from the treatments applied to the ground under them when the emulsion was used at the rate of 15–20 U.S. gals. per tree. The grass above the soil surface and any apple foliage on to which the emulsions were directly sprayed was killed, but the grass roots were little affected and new grass grew up immediately.

Parrott (P. J.) & Collins (D. L.). **Phototropic Responses of the Codling Moth.**—*J. econ. Ent.* **27** no. 2 pp. 370–379, 6 figs. Geneva, N.Y., April 1934.

The following is taken from the authors' summary: Studies of the activity of *Cydia* (*Carpocapsa*) *pomonella*, L., as indicated by light-trap and bait-pail catches in an apple orchard in New York in 1933, showed that flight was generally inhibited below 60°F. Other adverse weather conditions affected the bait pails more than the light-traps; high winds caused loss of material from the pails, heavy rains caused dilution and overflow, the extremely hot weather in 1933 caused too rapid evaporation, and other conditions led to souring of the bait. Emergence began earlier and reached its maximum sooner in the orchard as a whole than in cages in it. On cool nights, the trap catches were less in proportion to the daily emergence. Some marked virgin females were trapped on the day of liberation, showing that females are attracted before they have oviposited. Females represented 70 per cent. of the moths captured in bait pails and only 43 per cent. of those taken in light-traps, but the actual number of females captured per tree was about the same in both. In trees supplied with both, the light-traps captured nearly twice as many females as the pails.

Collins (D. L.). **The Occurrence of *Ascogaster carpocapsae* in illuminated and sprayed Areas of an Apple Orchard.**—*J. econ. Ent.* **27** no. 2 pp. 379–382, 1 ref. Geneva, N.Y., April 1934.

Ascogaster carpocapsae, Vier., appears to be the only larval parasite of *Cydia* (*Carpocapsa*) *pomonella*, L., occurring in appreciable numbers in western New York. Data collected by J. A. Cox in 1930–31 [*cf. R.A.E.*, A **20** 466] from 7 orchards showed percentages of parasitism varying between extremes of 10 in a sprayed orchard and 41 in an unsprayed one.

In 1933, in an orchard about 35 years old, parasitism ranged from 0 on trees on which light-traps and 4 cover sprays of lead arsenate were used to 30·31 per cent. where no control measures were employed. In plots sprayed once, infestation equalled or exceeded that in the untreated control trees, whereas parasitism was 50 per cent. lower. On trees that received 4 sprays of lead or calcium arsenate, infestation and parasitism were both lower than on trees receiving 1 or 2 sprays. Parasitism was three times as high in a lighted tree that was unsprayed as in those sprayed with lime-sulphur only. It was higher in the lighted unsprayed plots than in the unlighted sprayed plots showing equal control of the host, and no adults of *A. carpocapsae* were ever found in either light-traps or bait pails. This suggests that the reduction in parasitism that occurred in sprayed plots was due more to the direct effect of the sprays on the adult parasites than to reduction in the numbers of the host.

Walker (H. G.) & Anderson (L. D.). **Notes on the Use of Derris and Pyrethrum Dusts for the Control of certain Insects attacking Cruciferous Crops.**—*J. econ. Ent.* **27** no. 2 pp. 388–393. Geneva, N.Y., April 1934.

Larvae of *Phytometra* (*Autographa*) *brassicae*, Riley, and *Plutella maculipennis*, Curt., often seriously injure cruciferous crops near harvest time, when it is impossible to apply arsenical or fluorine sprays or dusts without risk of poisonous residues [*cf. R.A.E.*, A **22** 283]. A broccoli field in Virginia, about to head and heavily infested with larvae of both these moths and moderately with *Murgantia histrionica*, Hahn, was dusted with various materials. Pyrethrum gave better control of *Phytometra*, and derris of *Plutella*. Pyrethrum-talc dusts containing 0·5 and 0·3 per cent. pyrethrins were about equally effective, whereas dusts with 0·1 per cent. pyrethrin gave decidedly lower kills. Similarly derris dusts containing 0·5 per cent. rotenone were not appreciably inferior to those of 1 per cent., but markedly superior to those of 0·25 per cent. Practically all the derris and pyrethrum dusts gave better control at the end of 48 hours than did calcium arsenate-lime dust (1 : 3). In general, pyrethrum acted more quickly than derris. Of 8 carriers used with the derris dusts, talc was the best against the caterpillars, closely followed by gypsum and an inert clay. Newly made lime, flour, and tobacco dusts gave fair results, whereas lime that had been mixed with the derris 60 days previously and zinc sulphate-lime gave the worst. In an additional test, finely ground tobacco dust gave almost as good control as gypsum. In field tests, derris with talc, gypsum and the clay gave 77–79 per cent. control, but a much larger amount of the gypsum dust was required to cover a given acreage than of either of the other carriers, of which the clay required least.

Against *M. histrionica*, a derris-talc dust gave the best results, and all the derris dusts tested gave much better results than a pyrethrum dust. Examination 30 minutes after application suggested that pyrethrum was much more effective than derris, but after 48 hours all the bugs treated with the former had recovered, whereas many of those treated with derris had died. Tests of 5 carriers with derris dust gave results similar to those obtained against the caterpillars, except that gypsum gave slightly better results than talc and the clay. Results obtained in the field with derris dusts against *Murgantia* have varied even under approximately the same conditions.

GINSBURG (J. M.) & GRANETT (P.). **Insecticidal Properties of completely extracted Derris Root Residue.**—*J. econ. Ent.* **27** no. 2 p. 393. Geneva, N.Y., April 1934.

An abstract is given of a paper dealing with tests of the toxicity of derris root powder and its exhausted residues when applied in coarsely and finely ground dusts to silkworms [*Bombyx mori*, L.], cabbage worms [*Pieris*] and apple aphis [*Aphis pomi*, DeG.]. Derris root was more toxic to *A. pomi* when the dust was applied to wet rather than to dry foliage. Residue from derris root after complete extraction with acetone had practically no action on *A. pomi*, but was both toxic and repellent to the caterpillars. Residue left after extraction first with acetone and then with water did not appear to be directly toxic to the caterpillars, but deterred them from feeding on the dusted foliage.

BREAKEY (E. P.). **Halowax as a Contact Insecticide.**—*J. econ. Ent.* **27** no. 2 pp. 393–398, 1 fig., 4 refs. Geneva, N.Y., April 1934.

In laboratory tests in the United States, an emulsion of Halowax (a new chlorinated naphthalene product acting as a contact insecticide) and 0·25 per cent. potash coconut-oil soap killed 52 and 100 per cent. of the apple aphis, *Aphis pomi*, DeG., at 0·5 and 2 per cent. concentration respectively, whereas 0·25 per cent. soap alone killed only 7 per cent. An emulsion containing 1 per cent. of the Halowax killed 71 per cent. of *Aphis rumicis*, L. (bean aphis) and 70 per cent. of *Rhopalosiphum rufomaculatum*, Wils. (green chrysanthemum aphis). A similar emulsion in which some sulphur had been dissolved in the Halowax killed 100 per cent. of *Tetranychus telarius*, L., and *Macrosiphum sanborni*, Gill. (chrysanthemum aphis) and 90 per cent. of *A. rumicis*; with 0·5 per cent. of the soap, it killed 100 per cent. of *A. rumicis*, *Pseudococcus citri*, Risso, and *Thrips tabaci*, Lind. (onion thrips), 95 per cent. of *Eriosoma crataegi*, Oestl., 90 per cent. of *R. rufomaculatum*, and 75 per cent. of the larvae of *Datana integerrima*, G. & R.

An emulsion of 2 per cent. white oil, 1 per cent. Halowax and 0·25 per cent. soap killed 87 per cent. of *P. citri* and 100 per cent. of *A. rumicis* and *T. telarius*, as compared with 8 per cent. of *P. citri* and 33 per cent. of *T. telarius* killed by the same spray without the Halowax. A combination of 1 per cent. each of white oil and Halowax and 0·5 per cent. soap killed 100 per cent. of *T. telarius*, *M. sanborni*, immature *P. citri* and *Thrips tabaci*, 98 per cent. of *E. crataegi*, 90 per cent. of *M. rosae*, L. (rose aphis) and 70 per cent. of *D. integerrima*.

Field tests were carried out in Florida with specially prepared emulsions that were found greatly to exceed in toxicity those hitherto

used in the tests. Emulsions of Halowax and oil proved more toxic to Coccids than one of Halowax and sulphur, and trees and shrubs tolerated much higher concentrations (up to 3–4 per cent.) than vegetable crops. With the water available in Florida, another emulsifying agent had to be substituted for soap.

The most promising combination developed is one containing 0·5 per cent. each of Halowax and white oil with an emulsifier, or emulsifier and stabiliser, to produce the desired emulsion. It was effective against immature mealybugs and all stages of Aleurodids except perhaps the pupae, and it killed eggs as well as adults of *T. telarius*. It was at least as effective as Volck oil (1 : 100), nicotine sulphate (1 : 800), or Red Arrow [pyrethrum] (1 : 600) against *Thrips tabaci*, *Macrosiphum ribiellum*, Davis, *M. sanborni*, *A. spiraecola*, Patch, and *Tetranychus telarius*, particularly the last two. In greenhouses, cucumbers and tomatos were severely scorched by the combination as first prepared, but this was corrected by the use as an emulsifier of casein or (preferably) blood albumen (0·1 per cent., or rather more where sulphur was included).

Eddy (C. O.). **The Role of some Southern Pine Products in the Control of *Aphis rumicis* Linn.**—*J. econ. Ent.* **27** no. 2 pp. 398–400. Geneva, N.Y., April 1934.

These studies deal with the combination of pine tar or pine tar oil with soap or soap-nicotine solutions used against Aphids. They were saponified with alkali and water and used with the soap in water-soluble form. Liquid potash coconut oil containing 40 per cent. dry weight of soap was selected. The coconut oil and tar or tar oils may be mixed and saponified together in the presence of moderate heat, the process being facilitated by a rather large amount of water. When the combined total of potash coconut oil and tar or tar oil is below or not much above 40 per cent. of the solution, the process is relatively easy. Potash coconut oil (60 per cent. paste or 40 per cent. liquid) may also be added to saponified or partly saponified tar or tar oil and heat applied. Saponification of tar or tar oil alone in the presence of some water is aided by gentle heat. Solvents (alcohol, acetone, ether, etc.) facilitate saponification. These combinations require an excess of alkali to keep them in solution and out of emulsion, and they may become acid on dilution if too little alkali is used, thus producing variations in the toxic value of both soap and nicotine. When the combined total of potash coconut oil and tar or tar oil is much above 40 per cent. of the solution, the combination must be boiled under pressure or under a reflux condenser if the coconut oil is half or more of the mixture, in which case it is preferable to use the soap at 36 per cent. dry weight or below. Above that, mixtures become pastes and no longer fusible.

In tests with *Aphis rumicis*, L., and a green Aphid, some tars and tar oils improved the wetting power of the soap, whereas others decreased it, tar oils being in general more efficient than tars. The actual toxicity of the soap or nicotine-soap solutions was in some cases increased, tar oils containing the higher-boiling fractions being the most effective. Those least effective (reducing spread and toxicity) were crude pine oils containing many light fractions and fewer of the oily and higher-boiling fractions.

The tests showed that many of the tars or tar oils have toxic properties and add to the toxicity of coconut oil soap or soap-nicotine combinations owing to chemical activity and improvement of physical structure of the spray solutions, but they failed to reveal the presence of so-called activators for nicotine. In the hard waters of Kentucky, with small sprayers on smooth foliage such as that of nasturtium, 4 parts coconut tar oil spreader must be used to 1,000 parts of water. With this spreader, 50 per cent. nicotine (1 : 3,000) gave commercial control of the Aphids tested.

BILLINGS (S. C.). **Paradichlorobenzene, Naphthalene and Cedar Oils inefficient as Repellents against Clothes Moth Adult.**—*J. econ. Ent.* **27** no. 2 pp. 401–405, 4 figs., 2 refs. Geneva, N.Y., April 1934.

In tests of repellents against adults of *Tineola biselliella*, Humm., pieces of flannel were secured over the mouths of 5 bottles, which were almost filled respectively with naphthalene, paradichlorobenzene, cedar wood oil, cedar leaf oil and a 1 : 1 mixture of the oils. The odours of the various materials were observed to penetrate beyond the flannel for several inches. These bottles were placed on 11th April upright in raw wool in a moth breeding cage where adults were abundant and the temperature was maintained constant at 78°F. After 15 days, eggs and young larvae were abundant on each of the five pieces of flannel, distributed evenly over the exposed surfaces. The bottles were then kept in a room at a constant temperature of 80°F., and all the pieces of flannel (on the surface of which a little dry yeast was sprinkled) were badly injured by the larvae. In a similar experiment, there was no noticeable difference in the extent of damage to flannel over bottles containing respectively paradichlorobenzene, naphthalene, cedar wood oil and plain water. Previous tests [*R.A.E.*, A **17** 556] have shown that naphthalene and paradichlorobenzene do not repel the larvae.

In experiments with adults of *Trichophaga tapetzella*, L., eggs were laid indiscriminately on a flannel bag containing paradichlorobenzene and on untreated flannel.

Tests with numerous proprietary preparations containing one or more of these ingredients gave identical results.

HORSFALL (W. R.). **Some Effects of Ethylene Oxide on the various Stages of the Bean Weevil and the Confused Flour Beetle.**—*J. econ. Ent.* **27** no. 2 pp. 405–409, 1 ref. Geneva, N.Y., April 1934.

The following is the author's summary of results obtained in a study carried on during the past three years to determine the effect of ethylene oxide on some of the stages of both *Bruchus* (*Mylabris*) *obtectus*, Say [*cf. R.A.E.*, A **20** 35] and *Tribolium confusum*, Duv.: Treatment of the prepupae produced a disturbance of the normal development of the histoblasts that determine the adult appendages. Less injury was caused to pupae than to prepupae. Treatment of adults caused a decrease in oviposition, a delay of oviposition and more inactivity on the part of the females as the length of exposure increased. Unfertilised females were killed or prevented from ovipositing by an exposure that had no effect on the males.

Cutright (C. R.). **Effects on Apple Foliage of different Arsenicals and Fungicides in Combination.**—*J. econ. Ent.* **27** no. 2 pp. 417–420, 2 figs. Geneva, N.Y., April 1934.

Apple trees of 6 varieties in an orchard in Ohio were sprayed in 1933 (on 10th and 26th June and 18th July) with all the 25 possible combinations of 5 arsenicals and 5 fungicides. Defoliation records were taken by a method already noticed [*R.A.E.*, A **21** 660] during the last week in August. The percentage of defoliation on trees sprayed with lime-sulphur (plus lime), flotation sulphur, Bordeaux mixture (1 : 3 : 50) and Coposil, respectively, in combination with the various arsenates, was as follows: lead 14, 15, 12, 13; calcium 17, 40, 12, 30; manganese 16, 37, 12, 19; zinc 21, 39, 19, 33; magnesium 14, 15, 12, 15. A 9-point difference is necessary to show significance. Bordeaux mixture and lime-sulphur caused the smallest amount of leaf-drop. The safety of flotation sulphur when used with lead and magnesium arsenate as compared with its injuriousness when combined with calcium, manganese and zinc arsenate is striking. The fifth fungicide was an experimental one that caused uniformly severe injury. The percentage of fruit injured by the codling moth [*Cydia pomonella*, L.] following the application of the various arsenates was as follows: lead, 5; zinc, 6; calcium, 6; manganese, 7; magnesium, 18.

Chapman (P. J.), Pearce (G. W.), Dean (R. W.) & Hammer (O. H.). **Some Comparisons between Calcium Arsenate and Lead Arsenate as general Insecticides for Apple.**—*J. econ. Ent.* **27** no. 2 pp. 421–431, 3 figs., 13 refs. Geneva, N.Y., April 1934.

This paper deals with work on apple pests during the past 4 seasons, but principally in 1933, in districts of New York State where sprays are rarely applied later than 15th–20th July.

The following is mainly taken from the authors' summary: Equal weights of calcium arsenate and lead arsenate were about equally efficient against *Conotrachelus nenuphar*, Hbst., *Macrodactylus subspinosus*, F., *Nodonota puncticollis*, Say, and *Rhagoletis pomonella*, Walsh, whereas lead arsenate gave better results against *Cydia* (*Carpocapsa*) *pomonella*, L. A mixture of calcium arsenate, lime-sulphur and aluminium sulphate gave better results against *C. pomonella* than other calcium arsenate combinations. Commercial calcium arsenates vary in safeness. A correlation was found among the brands between the degree of foliage injury, amount of carbonation, and rate of arsenic weathering from spray deposits. No entirely safe brand was found. Foliage injury records were based principally on the occurrence of yellow leaves; such leaves occurred in three instances during the interval between spray applications, or about 2 weeks after the treatment responsible. Hydrated lime added to calcium arsenate sprays tends to suppress arsenical injury, but may simply postpone it. Aluminium sulphate proved superior to hydrated lime or ferrous sulphate as a corrective when added to calcium arsenate and liquid lime-sulphur. Calcium arsenate is less adhesive than lead arsenate, and the rate of arsenic loss is influenced considerably by the fungicide or corrective agent present. Trees with a full set of fruit appeared to suffer less foliage injury than trees in their off-bearing year. Injury was also pronounced on trees with subnormal root- and leaf-systems.

Driggers (B. F.) & Pepper (B. B.). **Bentonite Compounds as Agents for the Retention of Nicotine on Apple Foliage in Codling Moth Control.**—*J. econ. Ent.* **27** no. 2 pp. 432–440, 2 refs. Geneva, N.Y., April 1934.

The following is taken from the authors' summary and conclusions of studies in New Jersey [*cf. R.A.E.*, A **22** 293]: In analyses of 74 samples, twice as much nicotine was found on apple foliage sprayed with nicotine tannate and bentonite sulphur as on that sprayed with nicotine tannate alone. Nicotine was found 32 days after the last application of the former spray, even though heavy rains had occurred during the month previous to the analysis. Analyses of foliage sprayed with nicotine sulphate and soap and either bentonite sulphur or bentonite alone showed twice as much nicotine from the former spray. In two series of laboratory tests, apples sprayed with nicotine tannate and bentonite sulphur were more toxic to larvae of the codling moth [*Cydia pomonella*, L.] than apples sprayed with nicotine tannate alone, and subjecting the apples to outside exposure and soaking them in water showed that the former retained its toxicity to a greater degree and over a longer period than the latter.

Huckett (H. C.). **Field Tests on Long Island of Derris as an Insecticide for the Control of Cabbage Worms.**—*J. econ. Ent.* **27** no. 2 pp. 440–445. Geneva, N.Y., April 1934.

Tests were carried out on cauliflower, cabbage and broccoli in June–September 1933 with substitutes for arsenicals [*cf. R.A.E.*, A **22** 283] against *Pieris rapae*, L., and also against *Plutella maculipennis*, Curt., and *Phytometra* (*Autographa*) *brassicae*, Riley, which were less injurious but became increasingly numerous as the season advanced. The materials were generally applied at rates equivalent to 60–80 U.S. gals. spray or 20–40 lb. dust per acre.

The following is taken from the author's summary: Derris dusts proved effective in control. A derris-clay dust of 0·5 per cent. rotenone content applied 4 times at about 15-day intervals during a 10-week period of infestation gave as satisfactory control of *P. rapae* as 5 or 7 applications at shorter intervals. A derris-clay dust of 0·5 per cent. rotenone gave as satisfactory results as dusts of 1 per cent. [*cf.* **22** 402]; a dust of 0·33 per cent. was not so effective. Talc, clay and tobacco dust gave promise of being satisfactory carriers for derris dusts; hydrated lime apparently reduced their toxicity. Rotenone sprays were apparently inferior to dusts, though this may have been due to heavier infestation in the sprayed section. They were as effective at a dilution of 1 : 10,000 as at 1 : 5,000. There was very little difference in the comparative merits of the various spreaders used with rotenone.

Ginsburg (J. M.), Schmitt (J. B.) & Granett (P.). **Toxicity of various Extracts of Derris Roots to sucking and chewing Insects.**—*J. econ. Ent.* **27** no. 2 p. 446. Geneva, N.Y., April 1934.

An abstract is given of a paper describing experiments in which the toxic ingredients of derris root were extracted with acetone, alcohol and water, either by continuous distillation in a Soxhlet apparatus for 10 hours or by making a suspension of the ground root in the solvent and allowing it to stand for 48 hours. The mixture was filtered through cheesecloth and washed several times with fresh

solvent. Secondary extracts were obtained by extracting the residues left in the root by one solvent with another solvent. The primary and secondary extracts were tested on apple aphis [*Aphis pomi*, DeG.], silk moth caterpillars [*Bombyx mori*, L.] and mosquito larvae.

It was concluded that water-soluble organic solvents such as acetone and alcohol are able to extract practically all the water-soluble and water-insoluble ingredients of derris roots toxic to sucking insects, either by continuous distillation or by soaking with subsequent filtration and washing. Water does not extract all the toxic principles, but water extracts at low dilutions compared well in toxicity with acetone and alcohol extracts, though inferior to them in high dilutions. Water extracts rapidly deteriorate if left standing, with resultant loss of toxicity.

Hamilton (C. C.) & Gemmell (L. G.). **Some Field Tests showing the comparative Efficiency of Derris, Pyrethrum and Hellebore Powders on different Insects.**—*J. econ. Ent.* **27** no. 2 pp. 446–453. Geneva, N.Y., April 1934.

The following is taken from the authors' summary of experiments in New Jersey: In tests against various Aphids in the laboratory and *Periphyllus lyropictus*, Kess., on maple in a nursery, pyrethrum dust gave a quick and good kill and derris dust a fair one. When these dusts were diluted in water, the derris gave the better kill, though pyrethrum was satisfactory. Hellebore was unsatisfactory in either form. Derris or pyrethrum powder or a mixture of the two gave satisfactory control of *Erythroneura comes*, Say, on vines. With a power duster, derris dusts containing 0·5 per cent. rotenone were as effective as those containing 1 per cent., and a pyrethrum powder (containing 0·73 per cent. pyrethrins) with a clay carrier (1 : 4) gave good control. There were some indications that the pyrethrum powder acted more quickly, but that the derris powder retained its toxicity for a longer time. Hellebore was ineffective. Heavy applications of a dust containing 1½ per cent. nicotine knocked down the leafhoppers without killing them, but they were killed with a disk cultivator before they had time to recover.

In tests against *Galerucella luteola*, Müll., on elms, good control was obtained with derris powder, pyrethrum powder or mixtures of the two when applied at the rate of 1 lb. in 3 U.S. gals. water. The derris retained considerable toxicity and the pyrethrum some toxicity for 6 days. Hellebore had little toxicity at the end of 3 days. Tests on *Phyllotreta vittata*, F., on cabbage showed the possibility of good control with derris, pyrethrum or hellebore dust, derris dusts being the best and pyrethrum the worst.

Hartzell (F. Z.) & Pearce (G. W.). **Tentative Standard Concentration of Tar Distillates for certain Insects.**—*J. econ. Ent.* **27** no. 2 pp. 453–459, 2 figs. Geneva, N.Y., April 1934.

Owing to the wide differences in the composition of tar distillate emulsions in the United States [*R.A.E.*, A **22** 323; etc.], it is suggested that tentative standards be established as regards the concentrations of creosote and petroleum oils and tar acid required in sprays for different orchard pests, and that the manufacturers state on the label the percentage of these ingredients in the stock emulsion. The

creosote oil apparently should have a distillation range of between 200 and 350°C., with not more than 15 per cent. boiling below 230°C. The tar acid content should not exceed 5 per cent. Concentrations of this creosote oil varying from 1·6 to 4·5 per cent. give 70 to 100 per cent. mortality of various orchard pests, whereas from 2·5 to 6 per cent. of petroleum (lubricating) oil (viscosity 100 seconds at 100°F. Saybolt) is required to give 95–100 per cent. control of insects against which it is used. The danger point to the plant is fixed for apple trees tentatively at 6·2 per cent. oil concentration.

Formulae are given for the determination of the amount of either petroleum or tar distillate emulsion necessary to make a mixture containing a specific amount of either oil. A graph indicates the concentrations believed to be effective against certain insects or unsafe for apple trees, and another the amount of petroleum oil to be added to different stock emulsions for the control of the San José scale [*Aspidiotus perniciosus*, Comst.] in addition to other apple pests [*cf.* **22** 179, 300]. The maximum reasonably safe concentration of tar distillate emulsions with a total oil content of 80 per cent. is about 7½ gals. to 100 gals. spray. Light infestations of *A. perniciosus* together with other insects, except severe infestations of the bud moth [*Eucosma ocellana*, Schiff.], may possibly be controlled by a single application with comparatively little danger to the trees. *A. perniciosus* and leaf-roller [*Tortrix argyrospila*, Wlk.] can generally be controlled by a single application of an emulsion of 6 per cent. petroleum oil, but enough creosote oil to control other pests cannot be added to this without risk of tree injury, and though 6 per cent. petroleum oil is often effective in destroying Aphid eggs, it is not very effective against *E. ocellana* and only moderately so against scurfy scale [*Chionaspis furfura*, Fitch]. Experiments seem to show that, when two emulsions contain the same kind of emulsifier and the same kind of petroleum oil, the resulting mixture is reasonably safe, but until more is known regarding this problem, only such emulsions as are recommended by the manufacturers for the purpose should be mixed together.

Frost (S. W.). **Notes on Summer Oil Emulsions.**—*J. econ. Ent.* **27** no. 2 pp. 459–461, 1 ref. Geneva, N.Y., April 1934.

The results of spray tests conducted on apple and peach trees ranging from 4 to 16 years old in Pennsylvania to determine the limits of safety for summer oil emulsions, and if possible their insecticidal values, show the cumulative effect of applications made over several consecutive years. These investigations, as well as those conducted during 1932 [*R.A.E.*, A **21** 329], indicate that 2 per cent. summer oil emulsions alone can be safely used on apple, but if combined with lime-sulphur or wettable sulphurs they cause serious scorching, especially when applied in late summer. The finer the sulphur, the more serious is the scorching. When they are used in combination with Bordeaux mixture, a residue is left that cannot be removed and the fruit is permanently discoloured.

Certain commercial summer oil emulsions can be safely used at 2 per cent. dilutions on peach, and wettable sulphurs and basic lead arsenate may be added to them without causing injury. This combination is, however, useless against the oriental fruit moth [*Cydia molesta*, Busck] unless applied at weekly intervals.

Fox (H.). **The known Distribution of the Japanese Beetle in 1932 and 1933.**—*J. econ. Ent.* **27** no. 2 pp. 461–473, 3 maps, 2 refs. Geneva, N.Y., April 1934.

The distribution of *Popillia japonica*, Newm., in the United States up to and including 1933 is shown by means of a map, which illustrates the smallness of the area infested owing to the natural dispersal of the beetle as compared with that through which it has been scattered by the aid of man. Two further maps show its regional concentration within the area of continuous infestation [*R.A.E.*, A **20** 426], which increased from 8,000 sq. miles in 1932 to 8,800 in 1933, when, owing probably to the general reduction of the beetle population of that year, many parts of the area showed only a slight advance. The limits of the general area of continuous distribution are approximately defined by citation of localities. The sudden expansion of the area in Delaware, which was probably the most striking development in 1933, was due to its proximity to the main area of unusually heavy infestation in south-western New Jersey, which in 1933 was extended in that State to Delaware Bay. Early in July, following the period of north-east winds, large numbers of beetles were carried from this infestation out into the Bay, where they drifted about until cast up alive on the opposite shore, where they eventually became established.

The most impressive feature of the infestation in 1933 was the great reduction of the beetle population in the older infested areas as compared with the number present in 1932, apparently owing to deficient rainfall in the preceding summer when oviposition and hatching were at their maximum. Only in a few exceptional localities was infestation heavier than in 1932. Details are given of the progress of infestation in individual sections.

Metzger (F. W.). **An improved Japanese Beetle Trap.**—*J. econ. Ent.* **27** no. 2 pp. 473–476, 2 figs., 2 refs. Geneva, N.Y., April 1934.

Numerous tests have been conducted to increase the effectiveness of traps [*cf. R.A.E.*, A **21** 336 ; etc.] designed to capture the Japanese beetle [*Popillia japonica*, Newm.]. Many beetles attracted to the trap formerly recommended [**19** 354] strike the side of the funnel and are lost. Openings were therefore cut in the funnel to allow beetles to enter below the bait container. Of 3 types of traps tested, that giving the best results had the baffle extended to the bottom of the openings in the side of the funnel and a flap $1\frac{1}{2}$ ins. long sloping inwards from the top of each opening at an angle of 35° from the side of the funnel. The openings were 4 ins. wide at the top, $2\frac{1}{2}$ ins. at the bottom and $2\frac{1}{2}$ ins. long, so that their shape conformed with the sloping sides of the funnel. Four apertures of this size reduced the ineffective area of the trap by approximately one-third, and the number of beetles caught was increased by 33·1 per cent.

As the funnel is usually stamped out of one piece of material and no additional parts are necessary, this trap would probably cost no more than one with no funnel apertures, but care must be taken to insure a close fit between the edges of the flap and the sides of the baffle, as the beetles easily gain a foothold on slight projections or badly fitting joints.

HALLOCK (H. C.). **The Asiatic Garden Beetle as a Pest in Vegetable Gardens.**—*J. econ. Ent.* **27** no. 2 pp. 476–481, 6 figs., 3 refs. Geneva, N.Y., April 1934.

Aserica (*Autoserica*) *castanea*, Arrow, though known as a pest of ornamental plants near New York City [*R.A.E.*, A **21** 236], has only recently attacked vegetables to any great extent. From 1927 to 1929 the adults fed increasingly on carrots, radishes and rhubarb in Long Island, and by the end of 1931 carrots had become a favoured food-plant and parsnips and sweet potato were also attacked. During 1931 and 1932, the larvae for the first time caused loss by feeding on the roots of beets, carrots, onions and maize. In the summer of 1933, extensive damage was caused in vegetable gardens in Long Island, where one commercial grower lost 10 per cent. of his early beets as the result of larval feeding. Allotments in which vegetables had been grown in fields uncultivated previously for a number of years suffered most severely, owing to the presence of weeds known to be favoured food-plants. Surveys in a heavily infested area in October 1933 showed an average of 7 larvae per sq. ft. in the cultivated land and 49 in the sod. Examination of another cultivated area showed heavier infestation on the side adjacent to a field covered with golden-rod [*Solidago*], and larger numbers of larvae were found in the sod where golden-rod and hawkweed [*Hieracium*] predominated.

Larval feeding in vegetable gardens started soon after the seeds sprouted and continued until the end of June. All kinds of vegetables except onion setts were destroyed by the larvae feeding on the roots. Repeated resowing was necessary, and in some cases only vegetables maturing after 1st July could be used. Those that survived larval attack were severely injured by the adults. Rows of carrots and turnips were completely defoliated, entire leaves of large pepper plants [*Capsicum*] were eaten, and the hearts were eaten right out of cabbages. The adults have been observed to cause damage to 19 different vegetables, a list of which is given.

Sod areas heavily infested with *A. castanea* should not be used as vegetable gardens. The complete elimination of all weeds tends to reduce larval population, but the immediate result of the destruction of favoured food-plants of the adults is to increase defoliation among adjacent vegetables.

FELT (E. P.). **Japanese Scale, *Leucaspis japonica* Ckll.**—*J. econ. Ent.* **27** no. 2 p. 481. Geneva, N.Y., April 1934.

A general infestation of soft maple [*Acer saccharinum*] by *Leucodiaspis* (*Leucaspis*) *japonica*, Ckll., which has been established along the coast of southern New England and south-eastern New York for some time, has developed during the past few years in Long Island, red maple [*A. rubrum*] and Norway maple [*A. platanoides*] being also badly infested. The scale was also found on apple, pear and flowering dogwood [*Cornus florida*] growing near these trees. The relatively small number of living scales found on examination in April 1934 showed that both this Coccid and *Aspidiotus perniciosus*, Comst., had suffered a heavy mortality as the result of extreme cold during the winter.

Sim (R. J.). **Small Mammals as Predators on Japanese Beetle Grubs.** —*J. econ. Ent.* **27** no. 2 pp. 482–485. Geneva, N.Y., April 1934.

Observations during 1933 showed that many of the small terrestrial mammals found in the United States may feed on larvae of *Popillia japonica*, Newm., the more important found to do so experimentally being the common mole, large short-tailed shrew, skunk and pine mouse.

Parker (L. B.). **Notes on the Life History and Biology of *Centeter unicolor* Aldrich.**—*J. econ. Ent.* **27** no. 2 pp. 486–491, 1 fig., 2 refs. Geneva, N.Y., April 1934.

A preliminary study of *Centeter unicolor*, Aldr. [*R.A.E.*, A **17** 109], a parasite of the adults of *Anomala sieversi*, Heyd., and *A.* (*Phyllopertha*) *pubicollis*, Waterh., in Korea, was carried out in the spring of 1931 and 1932. The two hosts may be found in the field at Suigen from the last week in April through most of May, but do not occur in association, as each prefers a different plant environment. Parasitism of *A. pubicollis* was 27·2 per cent., the number of eggs to a host rarely exceeding 3. In the case of *A. sieversi*, the percentage was extremely variable (maximum 73·6), most of the parasitised beetles bearing more than 3 eggs each and some as many as 33.

All stages of *C. unicolor* and the manner of oviposition on the body of the host are described. Incubation and larval entrance require about 4–5 days according to temperature and position of the egg. The beetle normally dies 6–8 days after oviposition, and the Tachinid pupates about 4 days later. Where larvae are numerous, the host dies sooner. The second-instar larva of *C. unicolor*, like that of *C. cinerea*, Aldr. [**15** 298], is furnished with a sharp hook-like process, which probably serves to perforate and to attach it temporarily to one or more of the numerous air sacs within the body of the host, thus providing means of respiration. The larva appears to feed first in the abdomen, gradually working its way to the anterior and then back to the abdomen to pupate. The pupal stage lasts about 10½ months. Where the two sections of the beetle were partly severed, the full-grown larva sometimes emerged through the opening and pupated successfully either on or in the soil. Adults emerged from laboratory-bred puparia, but emergence from the shell of the host was not observed. The adults appear in the field simultaneously with the host beetles and disappear before them, the period of field prevalence being about 25 days. Their normal food is honey-dew and nectar. In the laboratory, they lived only 6 days, though in the field they probably live about 2 weeks. They are highly susceptible to desiccation. The maximum number of mature eggs found in a female was 24.

Balock (J. W.). **The Status of *Tiphia vernalis* Rohwer, an imported Parasite of the Japanese Beetle, at the Close of 1933.**—*J. econ. Ent.* **27** no. 2 pp. 491–496, 1 map, 3 refs. Geneva, N.Y., April 1934.

Tiphia vernalis, Roh., a parasite of the larvae of *Popillia quadriguttata*, F. (*castanoptera*, Hope) in Korea, was introduced into the United States against *P. japonica*, Newm., in 1924. It was first liberated in 1925, and was definitely proved to be established in 1928. Under laboratory conditions, it parasitises the larvae of various species of *Popillia* and *Anomala orientalis*, Waterh.

Adults of this Scoliid are found in the field in Pennsylvania from late April to early June, the females emerging 3–4 days after the males. Maximum emergence of females occurs about 19th May. The adults feed on honey-dew and nectar and are frequently found on the foliage of maple and cherry. Pairing occurs in the field as soon as the females emerge. When ready to oviposit, the female burrows in the ground, locates the host larva and after paralysing it lays an egg in the ventral groove. The egg stage lasts 9–10 days and the larval 20. The larva feeds on the host externally and when full-grown pupates in a cocoon suspended in the earthen cell of the dead host. It hibernates in the adult stage in its cocoon. Only 5·9 per cent. of the parasites imported in cocoons between 1924 and 1927 were successfully reared, but 68·5 per cent. of the adult females shipped from Korea since 1926 were received alive, and 86 per cent. of those shipped between 1930 and 1933 arrived active and healthy.

An account is given of methods of colonisation. In 1932, one colony in Pennsylvania had become sufficiently well established to serve as a collecting ground. Adults are attracted by spraying a mixture of equal parts of honey and water on the lower branches of trees, where they can easily be captured. Females are transferred in batches of 100 to tin containers (6 inches in diameter by 10 in depth) supplied with soil, food and water. In 1932 and 1933, the average number collected per man per hour was 33. Females collected locally were released in batches of 100 on the day following their capture, but imported females were generally kept for 2 days after the shipment was received. As shipments of adults usually arrive late in the season, when many of the hosts are in the pupal or prepupal stage and the females have only a limited period in which to work, large numbers had to be liberated in selected areas. The present distribution of *T. vernalis*, with the sites of colonies, is shown in a map. The number of colonies started between 1926 and 1933 is shown in a table, the present number being 197, including 112 from local collections during the past 3 years. During 1933, recoveries were made from 70 per cent. of colonies two or more years old. *T. vernalis* is known to be established in at least 22 sites and to be abundant in 6. Owing to the wide distribution of *P. japonica* and the comparatively recent establishment of the parasite, any part that it may be playing in control is difficult to determine. Digging in a district colonised 4 years previously indicated parasitism of 7·4 per cent. in one locality, and 28·8 per cent. over a limited area in another.

GARDNER (T. R.) **Comparative Oviposition Efficiency and Collection Costs of imported versus established *Tiphia vernalis* Rohwer, a Parasite of the Japanese Beetle.**—*J. econ. Ent.* **27** no. 2 pp. 497–499. Geneva, N.Y., April 1934.

A comparative study showed that 75 females of *Tiphia vernalis*, Roh., newly shipped from Korea [see preceding paper] laid a total of 2,882 eggs in oviposition cans whereas, 75 locally established females laid 4,479. Imported females, from the time of collection till death, lived an average of 51 days, of which only 25 were spent in the oviposition cans, whereas the local ones lived 38 days, all in the cans. The longer life of the former is mainly due to the low temperature at which they are stored during transportation. The actual cost of collection and transport in 1933 was 1·99 cents each for the imported and 2·56 for the local females. If allowance is made for the reduced

oviposition efficiency, however, the cost of imported material is equivalent to 3·09 cents per female. Further importations are now no longer necessary.

Lipp (J. W.). **The Effectiveness of Paradichlorobenzene and Naphthalene in preventing Oviposition by the Japanese Beetle.**—*J. econ. Ent.* **27** no. 2 pp. 500–502. Geneva, N.Y., April 1934.

In insectary tests in 1932, a thin layer of paradichlorobenzene crystals on the surface of the soil in pots proved very toxic to third-instar larvae of *Popillia japonica*, Newm., and adult females placed in pots similarly treated died before they could oviposit. Of other chemicals tested for preventing oviposition, naphthalene was the best. In outdoor tests, seven rows of seven 4-inch pots were embedded in the soil, and a thin layer of paradichlorobenzene crystals was scattered over the surface in alternate pots, all being finally covered with a ½-inch layer of untreated soil. A wire cage was then placed over these pots, and about 400 beetles were confined in it for a week. No eggs were laid in the treated pots, which contained up to 54 dead beetles each, none having penetrated below the crystals. In a similar test, naphthalene did not entirely prevent oviposition, but only 1·7 eggs were laid per pot as compared with 43·5 in the controls.

In 10-inch pots nearly filled with watered soil, 1 oz. paradichlorobenzene prevented oviposition for 18 days, and 2 oz. for at least 32 days. When 1 oz. naphthalene was used, 15 eggs were found in the pot subjected to infestation on the 11th day and examined on the 18th day after treatment, whereas the untreated pot contained 85 eggs. In pots infested on the 18th day after treatment, no protection was afforded by 1 oz. paradichlorobenzene. When 2 oz. naphthalene was used, oviposition was not entirely prevented until 21 days had elapsed between treatment and subjection to infestation. This apparent increase in efficiency may be accounted for by its slower rate of evaporation. Some time must elapse before the concentration of the naphthalene vapour in the soil layer above the crystals has been built up to the point where it is able to kill the beetles entering the soil to oviposit.

Hawley (I. M.). **A Preliminary Report on the Horizontal Movement of Grubs of the Japanese Beetle.**—*J. econ. Ent.* **27** no. 2 pp. 503–505. Geneva, N.Y., April 1934.

In bins (8 ft. × 4 ft.) filled with sandy loam, in which larvae of *Popillia japonica*, Newm., were placed in a trench 1 foot from one end and wheat was planted 1 ft. from the other end, 7 out of 161 larvae had moved more than 80 ins. in 37 days, 20 more than 60 ins., 50 more than 40 ins. and 78 more than 20 ins. In a comparative test in sod and in fallow soil, 1 out of 92 larvae recovered in the grass bin and 3 out of 79 in the fallow bin had moved more than 80 ins., and 4 and 33 respectively more than 60 ins. In the sod 95·6 per cent. of the larvae were in the upper 5 inches of soil (among the grass roots), and in the fallow only 16·5 per cent. Of the larvae that had grass to feed on, 17 had become prepupae, whereas none had done so in the fallow.

The distance from the starting point may represent only a fraction of that actually covered, as the larvae tend to change their course frequently. The greater movement in fallow ground is probably due to the incentive to find succulent food.

Schoene (W. J.). **Codling Moth Situation in Virginia.**—*J. econ. Ent.* **27** no. 2 pp. 505–508. Geneva, N.Y., April 1934.

Very serious losses were caused by the codling moth [*Cydia pomonella*, L.] in 1933 in Virginia, where some orchards bore no marketable fruit. Injury in severely infested orchards became apparent in July, when 30–50 per cent. of the apples were "stung." Climatic conditions have been favourable for the development of the moth since 1927, since when there has been no short apple crop. Dry weather in 1930 and 1932 resulted in many small apples that were left on the trees harbouring an accumulation of larvae. Previously, 3–4 sprays had given control without supplementary measures. A revised schedule, placing reliance on early sprays, was adopted in 1926 when the residue situation arose, and calcium arsenate was later substituted for lead arsenate in the last two sprays to meet lead tolerance. These changes have been partly responsible for the present situation.

Other information given in this paper has already been noticed [*R.A.E.*, A **22** 298].

Cory (E. N.). **Notes on Codling Moth Control in 1933.**—*J. econ. Ent.* **27** no. 2 pp. 509–514. Geneva N.Y., April 1934.

Infestation by the codling moth [*Cydia pomonella*. L.] in 1933 in Maryland varied from great severity on the Eastern Shore [*R.A.E.*, A **22** 299] to normal conditions in the west. The average infestation for the whole State was 8·7 per cent. and the average "stings" 29·9. One orchard in central Maryland had only 24·95 per cent. uninjured apples. Owing to the residue problem and lack of funds, most growers omitted the fourth cover spray and used calcium arsenate in the third and many in the second also. In some orchards where spraying was efficient, calcium arsenate compared very favourably with lead arsenate, even when it was used for all codling moth sprays, and in spite of the fact that the weather was decidedly favourable for spray injury and weathering off of spray mixtures. Comparative data are given showing the results of various lead and calcium arsenate schedules and of tests with alternative arsenicals. Of these, zinc arsenate showed considerable promise in a limited number of tests. The relatively high percentage of infestation in many orchards is likely to lead to much more general washing of fruit, allowing of more thorough and later spraying.

Brunson (M. H.). **The Fluctuation of the Population of *Tiphia popilliavora* Rohwer in the Field and its possible Causes.**—*J. econ. Ent.* **27** no. 2 pp. 514–518, 2 refs. Geneva, N.Y., April 1934.

Seasonal observations of some of the more promising colonies of *Tiphia popilliavora*, Roh., a larval parasite of *Popillia japonica*, Newm., imported from Japan in 1920 [*cf. R.A.E.*, A **19** 200], show that there is a marked fluctuation of the adult population from year to year. At a site in New Jersey, 1,100 females were collected for colonisation in 1927, 4,400 in 1928, 10,100 in 1929, and 510 in 1930. Collections in 1931 from two sites in New Jersey and one in Pennsylvania totalled 4,905, whereas in 1932 not more than a dozen females were taken at any one of these points. Adults were fairly abundant in 1933 in many colonies, but little increase was noted in the three mentioned. Observations in 1929 suggested that the primary if not the only cause of the

decrease at one site was the reduced number of host larvae, but at the other two *P. japonica* was well distributed and abundant in 1931.

Adults of *T. popilliavora* were found to be most abundant during August, when all three larval instars of *P. japonica* are present in the field. Percentages of larvae occurring in each of these instars at 4 stations in New Jersey during August 1932 and 1933 are shown in a table. Tests in 1932 showed that, though females prefer third-instar larvae for oviposition and the parasites develop to the cocoon stage most readily in them, the daily oviposition rate in second-instar larvae is not sufficiently less to account for the failure of colonies where there is a scarcity of hosts in the third instar. Further studies, however, showed that there was a preponderance of males among parasites emerging from second-instar larvae and of females among those from third-instar ones. Those emerging from larvae parasitised during August, when the grubs are mostly in the second instar, would thus consist largely of males. Among grubs obtained from the field daily from 19th August until 4th October, there was a large increase of third-instar larvae after 31st August, after which female parasites predominated.

Davis (A. C.) & Young (H. D.). **Sulphur Fumigation of Mushroom Houses.**—*J. econ. Ent.* **27** no. 2 pp. 518–525, 1 fig. Geneva, N.Y., April 1934.

The maximum combustion obtained by burning commercial sulphur (of the grade commonly used for fumigating by mushroom growers in Pennsylvania) in pans in mushroom houses was 14 per cent. with an average of 11·6 per cent., and the resulting concentrations of sulphur dioxide gas were of very little value in the control of pests. The maximum combustion of flowers of sulphur was 95 per cent. with an average of 84·2 per cent., and the average of the maximum concentrations obtained in the houses was above 10 mg. per litre. As many mushroom houses are not gas-tight, sulphur dioxide if generated slowly leaks out as fast as it is given off. It is thus a further advantage of the flowers of sulphur that it burns much faster. In an outside burner, from which the gas was blown into the house, the percentages burnt were 62·5 and 96·7; the concentrations obtained with the commercial sulphur were still rather low, whereas those from the flowers were well above 16 mg. per litre. In an empty house fumigated experimentally at a dosage of 2 lb. per 1,000 cu. ft., with ventilators and doors closed but not sealed, the concentrations obtained by burning flowers of sulphur in pans and in the outside burner were respectively just below and just over 10 mg. per litre as compared with 12 and 16·4 mg. per litre after all openings had been sealed with strips of paper and flour paste.

Distribution of gas within the house was studied by a method described. In burning sulphur within the house, good horizontal distribution can be secured by placing 3–5 sheet-iron pans at equal intervals along the central gangway. The air along the floor of an empty mushroom house may be 4–8° F. cooler than at the top. The heat from the burning sulphur, especially in the larger dosages customarily used (6 lb. to 1,000 cu. ft.), will raise the temperature at the top of the house by as much as 10 or 12°F., but will not greatly affect that along the floor level. The gas generated from the pans is very hot, and although sulphur dioxide is 2½ times as heavy as air at the same temperature, it tends to rise to the top of the house, uniform distribution being obtained only some time after the sulphur has stopped

burning, when leakage and absorption have usually reduced total concentration to a point too low to be of value. Thus some insects generally survive in the lower part of the house. Maximum concentrations reached at the top and middle of a house fumigated with a dosage of 2 lb. to 1,000 cu. ft. were 12·6 and 12 mg., whereas 1 inch from the floor, where the temperature was 6°F. lower, the concentration was only 6 mg. per litre. By the time that the distribution of gas was uniform throughout the house, the concentration had dropped to 2 mg. per litre. In experiments with 32 lb. (2 lb. to 1,000 cu. ft.) in the outside burner, on the other hand, the concentration at the top and middle of the house was usually the same (above 15 mg. per litre), and 1 inch from the floor it was usually above 12 mg. Distribution became uniform within a few minutes after maximum concentration had been reached and before the concentration at the bottom had dropped more than $\frac{1}{2}$ or 1 mg., and it remained uniform from then on. The vertical distribution was as good as the horizontal, and there were no air pockets.

Temperatures in mushroom houses while the manure is heating, immediately after the beds are filled, reach 90–100°F. or more at the bottom and 120–140°F. at the top. The fans used to correct this uneven distribution must be removed before fumigating with sulphur, the upper part of the house being again allowed to become the hottest. The heated gas will rise to the top of the house and remain there for some time, but the blast from the burner acts partly as a substitute for the fan, breaking up the initial uneven distribution and causing a much more uniform one. The excessive moisture produced by the manure, however, tends to take the sulphur dioxide out of the air as fast as it is generated. Dosages of more than 2 lb. to 1,000 cu. ft. are not advisable, as the absorption of gas tends to increase the acidity of the bed surface excessively. With this dosage, even if rapidly generated in the outside burner, very low concentrations of gas result, and the fall after the maximum has been reached is so rapid that relatively short exposures to a concentration lethal to pests result. Green moulds that sometimes form on the surface of the beds after fumigation with sulphur appear to be harmless.

In experiments in sulphur fumigation against various insect pests of mushrooms, adults and larvae of *Lepidocyrtus lanuginosus*, Gmel., and adults of *Sciara* sp. and *Megaselia iroquoiana*, Malloch, did not survive exposure for 43 minutes to a concentration rising to 4·4 mg. per litre. The kill of other pests was somewhat irregular, partly owing to their sheltering within pieces of moist spawn with which they were confined to prevent their drying out and into which the gas does not readily penetrate. All insects and mites actually exposed to the gas were killed in a mushroom house in which the concentration of gas reached 10 mg. and remained above 4 mg. for 87 minutes or more. Mites, especially in the hypopial stage, were the most difficult to kill, as they hide easily within the spawn pieces, and larvae of *Sciara* sometimes survive in this way also.

DeLong (D. M.). **The relative Value of Bordeaux Mixture, Sulphur and Pyrethrum Products in reducing Populations of the Potato Leafhopper** (*Empoasca fabae* **Harris).**—*J. econ. Ent.* **27** no. 2 pp. 525–533, 12 figs. Geneva, N.Y., April 1934.

The following is almost entirely taken from the author's summary of the results of several seasons' work in the control of *Empoasca fabae*, Harr., on beans and potatoes in Ohio : Bordeaux mixture causes the

sap of plants to become toxic to *E. fabae* for a week or 10 days [*cf. R.A.E.*, A **18** 483], but is sometimes injurious to bean plants. Of contact insecticides, the only one that has given any promise is pyrethrum, which is highly toxic to *E. fabae* as a dust or spray but has no residual value. Spray flotation sulphur paste, wettable dry sulphur, and dry-mix spray (8, 5 and 12½ lb. respectively to 50 U.S. gals.) have all given excellent results, leaving a residual effect similar to that of Bordeaux mixture. Where dusting is more practicable, 300-inch mesh dusting sulphur combined with 5–10 per cent. of pyrethrum dust for immediate effect has proved highly successful. This is probably the safest and most economical form in which sulphur can be used. Sulphur products also control red spider [*Tetranychus telarius*, L.] on bean and may be of some value against the bean beetle [*Epilachna corrupta*, Muls.], whereas Bordeaux mixture is of practically no value against either of these pests.

WAKELAND (C.). **Flight Studies of *Bruchus pisorum* L. (Coleoptera, Bruchidae).**—*J. econ. Ent.* **27** no. 2 pp. 534–542, 5 figs., 4 refs. Geneva, N.Y., April 1934.

Observations in northern Idaho and eastern Washington, where peas are an important crop, have shown that hibernating adults constitute the source of their infestation in spring by *Bruchus pisorum*, L. [*cf. R.A.E.*, A **22** 215, etc.]. Studies were conducted in Idaho in 1930–32 on the flight of the beetles by means of traps already noticed [**22** 94], the construction of which is described in detail. They were erected on high knolls about 1 mile apart and at heights varying from 6 inches to 70 ft. above the ground along a line about 5 miles long from the heart of the pea-growing area to the edge of the forest. Most of the traps were examined weekly during the first year and on alternate days during the two following ones. In the 3 years, 7,529 beetles were captured in 27 traps.

It was found that the autumn flight begins shortly after the first adults start to emerge from the peas and continues for about 2½ months, the maximum occurring after the first rains [*cf.* **22** 93], as the pea pods crack soon after they dry up again and so allow the beetles to escape. Although the greatest numbers were trapped near the ground, many fly at least as high as 70 ft. in cultivated areas and 50 ft. at the edge of the forest a mile distant from the pea-fields. Large numbers fly in autumn to forest areas, but the trap records did not show any definite direction of flight. A relatively small spring flight was registered. The dominant tree in the forest areas is *Pinus ponderosa*, with which are associated *Pseudotsuga taxifolia* and *Larix occidentalis*. Numerous deep cracks extending radially from the surface toward the centre of the tree in *P. ponderosa* render this species peculiarly favourable for the hibernation of the Bruchid, the bark of the other species being much more closely appressed and lacking in deep cracks. Living beetles were excavated from *P. ponderosa* in every situation near pea fields, and at distances of up to 3 miles [*cf.* **16** 219]. Some of the trees were situated deep in the forest. The height at which the Bruchid can hibernate appears to be limited only by the character of the bark ; the numbers decreased from the base up to 40 ft., where the bark became too smooth.

Examination of the trees in spring and autumn in a given locality gives some indication of the relative abundance of the Bruchid in different years. In 1930, the last beetles left the bark about 12th June, and the first migrants of the new generation reached it between 29th

August and 4th September. As some overwintered beetles were found still under the bark on 22nd August 1932, when individuals of the new generation began to reach the tree, a small percentage may hibernate for more than one year.

McGregor (E. A.). **The Relationship of Fineness of Sulfur Particles to Effectiveness against the *Citrus* Thrips in central California.**—*J. econ. Ent.* **27** no. 2 pp. 543–546, 2 figs., 6 refs. Geneva, N.Y. April 1934.

Findings of other workers are quoted showing that more finely ground sulphur dusts are more readily oxidised at ordinary temperatures, and that sulphur particles fail to adhere to the foliage of fruit trees when larger than 27 μ in diameter, whereas for really good coverage all the sulphur should pass through a 325-mesh screen (*i.e.*, be less than 35 μ in diameter). In the course of experiments with sulphur against various crop pests, the author became increasingly impressed with the importance of fineness and arranged an experiment for the control of *Scirtothrips citri*, Moult., in an orange grove in California with a view to determining a correlation between relative fineness of sulphur particles and insecticidal efficiency. Quantities of sulphur of 3 distinct degrees of fineness were specially prepared, the other specifications being identical ; each sulphur was rendered free-flowing by the addition of 1 per cent. magnesium carbonate. Extreme care was taken to render the conditions of application identical. At harvest time, trees were stripped of oranges and counts were made of fruit sufficiently damaged to disqualify it for the first grade. It was found that the average reduction in thrips injury was 74·2 per cent. by the coarsest sulphur (200-mesh), 83·6 per cent. by the medium grade (325-mesh), and 92·7 per cent. by the finest grade (400-mesh). The three distinct sulphurs exhibited the same relative effectiveness in duplicated experiments.

Hixson (E.). *Myelois venipars* **attacking Apple in Oklahoma.**—*J. econ. Ent.* **27** no. 2 p. 547. Geneva, N.Y., April 1934.

Larvae of *Myelois venipars*, Dyar, which has been previously reported from Arizona and California as attacking oranges and lemons, were found in apples in an orchard in Oklahoma on 15th December 1933. When placed in rearing jars, they quickly spun cocoons and pupated, the adults emerging between 1st and 3rd January 1934. Later collections made in mid-January produced moths during the first week in February. During this period, the minimum outside temperature had been 14°F. without any of the larvae having been killed. The larvae remain in their cocoons within the apples as long as they are left out of doors, but pupate after being brought into warmer air, suggesting that, if they survive the winter, they do so in the larval stage. Attack on apple by *M. venipars* seems to have followed injury by the codling moth [*Cydia pomonella*, L.].

Knowlton (G. F.) & Thomas (W. L.). **Host Plants of the Potato Psyllid.**—*J. econ. Ent.* **27** no. 2 p. 547. Geneva, N.Y., April 1934.

Greenhouse and laboratory rearing tests showed that *Paratrioza cockerelli*, Šulc, will oviposit and develop to the adult stage on about

40 species of plants, chiefly Solanaceae, that occur in the United States, a list of which is given. The nymphs matured upon several varieties of tobacco. An additional list is given of over 30 plants on which the adults fed and oviposited, although the nymphs failed to mature.

YOUNG (P. A.). **Wheat Bunt, a new Food for Grasshoppers.**—*J. econ. Ent.* **27** no. 2. p. 548, 1 fig., 1 ref. Geneva, N.Y., April 1934.

Melanoplus mexicanus, Sauss., and *M. packardi*, Scudd., were observed in the western half of Montana in 1933 to show an apparent preference for bunt balls over wheat kernels in fields that contained much bunt (*Tilletia levis*), thus facilitating the detection of the fungus in both green and white heads of wheat. The grasshoppers chewed the wheat glumes and ate large parts of the bunt balls, leaving little except the bare rhachis of many bunted heads, which resembled those damaged by loose smut (*Ustilago tritici*). Selection of bunted heads is probably facilitated by their prominent odour. The bunt balls have been shown to contain 3·35 to 8·1 per cent. more protein than the associated wheat kernels.

THOMPSON (G. A.). **Green Peach Aphid injuring Snapdragon.**—*J. econ. Ent.* **27** no. 2 p. 549. Geneva, N.Y., April 1934.

Winged forms of *Myzus persicae*, Sulz., were observed in greenhouses in southern Rhode Island in November 1933, apparently causing injury to snapdragon [*Antirrhinum*]. This took the form of stunted growth and ridges and papillae on the flowers and leaves, accompanied by malformed and rolled leaves and somewhat malformed flowers.

MUNGER (F.). **Investigations in the Control of the Cyclamen Mite (*Tarsonemus pallidus* Banks).**—*Tech. Bull. Minn. agric. Exp. Sta.* no. 93, 20 pp., 29 refs. St. Paul, Minn., May 1933. [Recd. May 1934.]

The bionomics of *Tarsonemus pallidus*, Banks, and measures that have been used for its control are reviewed from the literature [*cf. R.A.E.*, A **22** 128; etc.], and an account is given of experiments against it on greenhouse plants, particularly cyclamen, in Minnesota. Cyclamen seeds should be examined for mites before planting, and if infested may be treated with warm water (115°F.) for five minutes without material injury to them. Rotation of crops within the greenhouses may help in reducing infestation. In general, sprays, dusts and fumigants that did not injure the plants failed to destroy the mite. Fumigation with pure nicotine or pyridine showed some promise, and there is evidence that the repellent effect of frequent nicotine sprays keeps plants free from infestation, but it was concluded that hot water treatment is the only method available for eradicating the mites from infested plants. The results of such treatment of numerous greenhouse plants are given in a table; 30 seconds at 120°F. was usually insufficient for control. In treating fuchsia and chrysanthemum, 113–115°F. for 5–6 minutes is effective and injury does not result. Cyclamen, on the other hand, which must be treated before the flower-buds appear, can only withstand 115°F. for 5 minutes; this, however, destroys the mite. Begonia can be effectively treated at 116·5°F. for 2 minutes. All plants should be shaded from the light for 2 or 3 days after treatment.

Wichman (H. J.), Murray (C. W.), Harris (M.), Clifford (P. A.), Loughrey (J. H.) & Vorhes, jr. (F. A.). **Methods for the Determination of Lead in Foods.**—*J. Ass. off. agric. Chem.* **17** no. 1 pp. 107–135, 2 figs., 28 refs. Washington, D.C., February 1934.

This paper summarises the results of an intensive study carried out in 1933 in view of the potential danger of relatively minute quantities of lead in foods, and describes 6 methods for their determination, particularly in spray residues. The methods are presented in the order in which they were developed, and their practicability increases in about the same order.

Spencer (G. J). **Notes on *Rhyncocephalus sackeni*, Will., a Correction (Nemestrinidae Diptera).**—*Canad. Ent.* **66** no. 4 p. 87. Orillia, Ont., April 1934.

The Nemestrinid recorded as possibly parasitic on Cerambycids in British Columbia under the name of *Neorhynchocephalus* (*Rhynchocephalus*) *sackeni*, Will. [*R.A.E.*, A **20** 593] has now been identified as *Parasymmictus clausus*, O.-S. The occurrence of this fly at 52° N. lat. seems to be the northernmost record of a member of this family in the world.

Bruner (S. C.). **Notes on Cuban Dicyphinae (Hemiptera, Miridae).**—*Mem. Soc. cubana Hist. nat.* **8** no. 1 pp. 35–46, 3 pls., 6 refs. Havana, March 1934.

It is stated that records of *Dicyphus minimus*, Uhl., on tobacco in Cuba are probably erroneous. *Cyrtopeltis varians*, Dist. (of which *D. luridus*, Gibson [*R.A.E.*, A **6** 130] is a synonym) is a pest of tobacco in Cuba and Porto Rico [*cf.* **6** 486; **18** 580], but is sometimes predacious [**18** 486]. It has also been found on tomato in Cuba. *C. tenuis*, Reut., was observed locally in Cuba breeding in numbers on *Sesamum orientale*, though not sufficiently abundant to cause appreciable damage. It has been found on tomato in Cuba and Porto Rico.

Nymphs and adults of *Macrolophus* (*Pandama*) *praeclarus*, Dist. (of which *D. prasinus*, Gibson, described from tobacco in Porto Rico [*cf.* **6** 130, 486] is a synonym) occurred regularly, but in small numbers, on tobacco in Cuba, where it has also been taken on sunflower. It is evidently largely predacious. The species recorded from Grenada as *M.* (*D.*) *separatus*, Uhl. (which occurs in the United States) is really *M. praeclarus*.

Moutia (A.). **Entomological Division.**—*Rep. Dep. Agric. Mauritius 1932* pp. 43–51, 6 pls. Port Louis, 1933. [Recd. May 1934.]

The situation as regards *Lachnosterna* (*Phytalus*) *smithi*, Arrow, and its parasites in Mauritius during 1932 is discussed [*cf. R.A.E.*, A **21** 220, 643]. An appended diagram illustrates the lack of synchronisation between the occurrence of numbers of *Tiphia parallela*, Smith, and of host larvae [*cf.* **21** 424]. The life-cycle of the parasite was 65 days in summer and 102 in winter. Three entomophagous fungi, *Beauveria densa*, *B. bassiana* and *Metarrhizium anisopliae*, have been introduced for experiments against the larvae of *L. smithi*. A survey of *Diatraea venosata*, Wlk. [*cf.* **22** 259] showed that the average number of borers to 100 lb. sugar-cane was 39, the percentage of nodes attacked being 10–25, representing a loss in yield of 15 tons per acre in some parts of

the Island. Applications of Paris green or lead arsenate to lawns appeared to be of some value against *Crambus emmerezellus*, de Joannis, as did improving the condition of the soil by treating it with ferrous sulphate and ammonium sulphate. A spray of 1 lb. coal-tar boiled in 2 gals. rain-water and diluted to 60 gals. was to some extent a repellent against the Cecidomyiid, *Procontarinia matteiana*, Kieff., on mango.

Pests recorded in a table similar to that given in the previous report [**21** 425] include: *Dacus ciliatus*, Lw., and *D.* (*Tridacus*) *emmerezi*, Bezzi, on cucurbits; *Sitodrepa panicea*, L., infesting books; *Cratopus* spp., on tung oil plants [*Aleurites fordi*] and *Cryptomeria*; *Elachista* sp. on sweet potato; *Thrips tabaci*, Lind., on onion; *Crocidolomia binotalis*, Zell., on crucifers; *Bruchus chinensis*, L., on beans (*Phaseolus*); and *Brontispa limbata*, Waterh., on palm trees.

Parasites identified during the year included *Tetrastichus* sp. from *P. matteiana*, and *Sturmia atropivora*, R.-D., from *Acherontia atropos*, L.

[Bugdanov (G. B.).] **Бугданов (Г. Б.). Pests of Maize in the Territory of the Ingush Autonomous Region.** [*In Russian.*]—*Izv. Ingushsk. nauchno-issled. Inst.* [*Bull. Ingush sci. Res. Inst.*] **4** no. 1 pp. 93–106, 20 refs. Ordzhonikidze, 1932. (With a Summary in German.) [Recd. May 1934.]

An account, based on observations carried out during 1922–32, is given of the bionomics, and sometimes control of the principal insects and rodents attacking maize in Ingushia (North Caucasus), where this crop occupies 87 per cent. of the arable land. Of the insects, the most injurious are *Pyrausta nubilalis*, Hb., *Gryllotalpa gryllotalpa*, L., *Loxostege sticticalis*, L., *Locusta migratoria*, L., *Blaps halophila*, Fisch., *Melolontha pectoralis*, Germ., and *Pentodon idiota*, Hbst., and in stored maize *Tinea granella*, L., *Calandra granaria*, L., and *Tenebrio molitor*, L. Less important species, which are briefly discussed, are *Calliptamus italicus*, L., *Gryllus desertus*, Pall., *Haplothrips aculeatus*, F., *Sipha maidis*, Pass., *Aphis euonymi*, F., *Tetraneura ulmifoliae*, Baker (*ulmi*, DeG.), *Euxoa segetum*, Schiff., *Feltia exclamationis*, L., *Heliothis obsoleta*, F., and *Amphimallus* (*Rhizotrogus*) *solstitialis*, L.

A key to the insect pests is given, based on the injury caused, and a tabulated list of all the pests shows the injurious stage and the part of the plant attacked.

A formiga argentina e métodos de a combater. [The Argentine Ant and Methods for its Control.]—*Folheto Div. Serv. Insp. fitopat. Minist. Agric. Portugal* no. 1, 15 pp., 9 figs. [Lisbon] December 1933. [Recd. June 1934.]

Iridomyrmex humilis, Mayr, appeared in Portugal in 1894 [*cf. R.A.E.*, A **19** 626] and now occurs throughout the country, where it is a very serious pest in orange plantations, as it fosters Coccids and Aphids. Two formulae for poison baits are given, somewhat similar to one already noticed [**8** 285]. The first consists of 250 fl. oz. water, 500 oz. sugar, $\frac{1}{2}$ oz. tartaric acid (crystals), $\frac{1}{2}$ oz. sodium benzoate and $1\frac{1}{3}$ oz. sodium arsenite, and the second, which is more attractive, of 500 fl. oz. water, 850 oz. sugar, 50 oz. honey, which must be pure and strained, $\frac{4}{5}$ oz. tartaric acid, $\frac{4}{5}$ oz. sodium benzoate and $2\frac{2}{3}$ oz. sodium arsenite. The bait is placed with clean wood shavings in containers of cardboard or waxed paper, perforated to allow the ants to pass in and out, and some of the ends of the shavings are drawn

through the holes. By capillary action, these wisps become wet and attract the ants. The containers are pinned to trunks or walls between April and June, the syrup being changed where it ferments or liquefied anew by adding water when it becomes pasty.

Boxes, tins or pots filled with leaves and earth and placed in sheltered positions will be used by the ants for their nests and must be cleared monthly from November to May. Trees may be banded with an adhesive or fitted with a guard consisting of a bottomless earthenware pot divided vertically into two halves, which are fastened together round the foot of the tree with wire, the joints being then sealed with cement. The upper edge of the pot is double, thus forming a gutter, the inner side of which is curved outwards to prevent rain from falling into it. Used lubricating oil is placed in the gutter, and the space between the pot and the trunk is filled with sand, in which the ants do not tunnel. In winter the sand must be removed to keep the trunk dry.

Papers noticed by Title only.

Aadselbillens Levevis og Bekaempelse. [The Life-history and Control of *Blitophaga opaca*, L., on Beet in Denmark.]—*Medd. St. Forsøgsv. PlKult.*, no. 92 (3rd edn.), 4 pp., 3 figs. Lyngby, March 1934. [*Cf. R.A.E.*, A **10** 626.]

Mordvilko (A.). **On the Evolution of Aphids.**—*Arch. Naturg.* (N.F.) **3** no. 1 pp. 1–60, 38 figs., 59 refs. Leipzig, 19th April 1934.

Lühmann (M.). **Zur Biologie des Schneeballkäfers** *Galerucella viburni* **Payk.** [The Biology of *G. viburni* on *Viburnum* in Germany.]—*Ent. Bl.* **30** no. 2 pp. 50–53, 3 figs. Krefeld, 30th April 1934. [*Cf. R.A.E.*, A **22** 346.]

Hering (M.). **Die Blattminen am Pflaumen- und Kirschbaum.** [The Leaf-mines caused by Insects on Plum and Cherry.]—*Anz. Schädlingsk.* **10** no. 5 pp. 51–55, 7 figs. Berlin, 15th May 1934.

Pfeffer (A.). **Zavíječ modřínový** *Enarmonia* (*Epinotia*, *Steganoptycha*) *diniana* **Gn.** (*pinicolana* **Z.**). [The Larch Tortrix, *E. diniana*, on Spruce in Czechoslovakia.]—*Lesn. práce* **9** reprint 24 pp., 4 figs., 6 graphs, 6 pls., 17 refs. Písek, 1930. (With a Summary in German.) [Recd. May 1934.] [*Cf. R.A.E.*, A **19** 325.]

Šulc (K.). *Metadenopus festucae* **n. gn., n. sp. sf. Coccinae, patria Moravia, ČSR.** [*In Czech.*]—*Acta Soc. Sci. nat. morav.* **8** no. 12, 17 pp., 5 figs. Brno, 1933. (With a Summary in English.) [Recd. June 1934.]

Šulc (K.). *Thymaspis fusca* **n. gn., n. sp.,** *Aspidiotus baudyši* **n. sp. (Coccidae, sf. Diaspinae), patria Moravia ČSR.** [*In Czech.*]—*Acta Soc. Sci. nat. morav.* **9** no. 3, 21 pp., 8 figs. Brno, 1934. (With a Summary in English.)

Roark (R. C.). **A Bibliography of Chloropicrin, 1848–1932.** [533 annotated titles.]—*Misc. Publ. U.S. Dep. Agric.* no. 176, 88 pp. Washington, D.C., February 1934. [Revision of previous bibliographies (*R.A.E.*, A **14** 628; **16** 368; **19** 176).]

ROARK (R. C.). **A Review of Derris Patents issued in various Countries recently covering Derris, Cube** [*Lonchocarpus*], **and Tephrosia Insecticides.**—*Soap* 1934, pp. 91, 95, 97, 99. New York, March 1934.

WINTERS (R.) & SMALL (C. G.). **An automatic Moisture-recording Device** [for recording the presence of a film of water on foliage].—*Phytopathology* **24** no. 3 pp. 284–288, 1 fig. Lancaster, Pa, March 1934.

SMALL (C. G.). **Quantitative Determination of Sulphur on Leaves by Titration.**—*Phytopathology* **24** no. 3 pp. 296–299, 1 fig., 3 refs. Lancaster, Pa, March 1934.

BLODGETT (F. M.) & MADER (E. O.). **A Method of recording the Distribution of Copper Dusts or Sprays on Leaves.**—*Phytopathology* **24** no. 4 pp. 418–422, 1 fig. Lancaster, Pa, April 1934.

DICKMAN (A.). **Studies on the Waxmoth,** *Galleria mellonella*, **with particular Reference to the Digestion of Wax by the Larvae.**—*J. cellul. comp. Physiol.* **3** no. 2 pp. 223–246, 2 figs., 24 refs. Philadelphia, Pa, 20th June 1933. [Recd. May 1934.]

LUDWIG (D.). **The Progression Factor in the Growth of the Japanese Beetle** (*Popillia japonica* **Newman**) **(Coleop. : Scarabaeidae).**—*Ent. News* **45** no. 6 pp. 141–153, 21 refs. Philadelphia, Pa, June 1934.

WEBSTER (R. L.). **Arsenic Deposit and Codling Moth Control** [*Cydia pomonella*, L., in Washington].—*J. econ. Ent.* **27** no. 2 pp. 410–417. Geneva, N.Y., April 1934. [*Cf. R.A.E.*, A **22** 217.]

BRITTAIN (W. H.) & NEWTON (D. E.). **Further Observations on the Pollen Constancy of Bees.**—*Canad. J. Res.* **10** no. 3 pp. 255–263, 1 pl., 1 fig., 2 refs. Ottawa, March 1934. [*Cf. R.A.E.*, A **22** 35, 112.]

RONNA (E.). **Catalogo dos insétos até hoje encontrados nas plantas do Rio Grande do Sul.** [Catalogue of insects hitherto found on Plants in the State of Rio Grande do Sul, Brazil.]—*Egatea* **19** no. 1–2 pp. 15–20. Porto Alegre, 1934. [Continuation, see *R.A.E.*, A **22** 112.]

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